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Coal-Burning Ships and Electricity.

A NOTABLE feature of the *Proceedings* of those of our technical and scientific institutions which deal more particularly with the problems of marine engineering and shipbuilding has been the extent to which the subject of the coal-burning ship has been discussed of late. The almost phenomenal development of the motorship during the past decade, apart from the extent to which it has affected our own marine engineering and shipbuilding industry by enabling foreign manufacturers to enter the field in competition with our old-established firms, has of necessity diminished the demand for coal for bunkers, and is thus to no small extent responsible for the present unhappy position of the sorely-stricken coal-mining industry. During 1913 the amount of coal raised in these islands was 287,400,000 tons, and during 1927 it was 256,000,000, a decrease of 12.25 per cent. despite the fact that the first months of 1927 witnessed an unusual activity following the prolonged stoppage of the previous year. It is certain that this decrease in the demand for coal is due in large measure to the diminishing demand for bunkers for coal-burning ships and for supplies to foreign bunkering stations. Nor is this the whole of the story: the returns issued by Lloyd's Register of Shipping show that at June 30th, 1914, the gross tonnage of ships in the world was 45,404,000 tons, while at June 30th, 1927, this total had swollen to 63,267,000 tons, so that a big increase in the demand for coal for ships' bunkers might have been expected; but whereas in 1914 the number of motorships registered was only 297 of a total gross tonnage of 234,287 tons, by June 30th, 1927, these figures had become 2,552 vessels of 4,270,824 gross tons. It will be realised, therefore, to what extent the growth of the oil-engine-propelled vessel has reacted upon the demand for coal. It is, moreover, necessary to add to these totals the figures for ships propelled by steam but burning oil in the furnaces of the boilers, and here we find that since 1914 the figure has increased from 1,310,209 tons to no less than 18,481,759 tons, these figures, of course, not including naval vessels, which are

to-day exclusively propelled by oil. Small wonder, therefore, that engineers are looking to the resuscitation of the coal-burning ship as a means of assisting the coal industry.

Apart from the direct influence which a return to coal as the fuel for merchant ships would have upon the mining industry, it would also be of considerable indirect value to the electrical industry at the same time. In order to render the coal-burning ship a more economical proposition than the Diesel-driven vessel, it is essential that not only the cost of construction but also the cost of operation and maintenance should be lower with the former than it is with the latter. The first condition is already amply fulfilled, but in order to comply with the second, experiments are being vigorously pushed forward with installations using steam at very high pressure and temperature, and with others using pulverised coal, and coal fed to the boilers by mechanical stokers. Both of these systems are firmly established in generating-station practice on land, but the peculiar conditions on board ship have hitherto prevented their adoption afloat. Of even greater importance than this more scientific use of coal is the necessity of obtaining supplies at the cheapest possible rates. This demand for cheap coal involves in its turn the more economical production of coal at the mines and, as is universally recognised, to obtain economical production it is essential that electrical machinery should be employed to the utmost, not only on the surface, but underground as well.

The improvement in the methods of burning pulverised coal on board ship, as represented by its use in the furnaces of the ordinary cylindrical-type marine boiler, suggests that the principle of pulverisation could be applied to existing batteries of Lancashire-type boilers, thus enabling colliery waste to be employed without the necessity of installing large and costly water-tube boilers, the steam so generated to be employed for the generation of electrical energy. As an alternative, but one involving greater initial capital cost, instead of burning pulverised raw coal on board ship, a demand might be created for the pulverised residue of low-temperature carbonisation, which is another system now in process of active development. If this could be accomplished the gas thus obtained, to the extent of 4,000 to 6,000 cu. ft. per ton of coal carbonised and of calorific value 750 B.th.u. per cu. ft., could be utilised either for steam production or directly in the cylinders of large gas engines, in both cases for the generation of electricity. The great difficulty which confronts the sponsors of the various carbonisation processes is to find a market for the by-products, both solid and gaseous, the liquid hydrocarbons in the form of light and heavy oils being readily absorbed. If the solid residue is used extensively as fuel on board ship, the gaseous fuel can be used as we have suggested for the production of electrical energy at the pit head at very cheap rates, thus assisting the economical production of the coal itself. If, as seems probable, an excess of electricity were available over and above that required at the mines, it could be metered to the "grid," and thus assist in solving the problem of supplying electricity to the surrounding industries.

All this may, perhaps, appear to be an ideal state of affairs capable of fulfilment only in the distant future. It must not be forgotten, however, that the coal industry is at present wandering in the vicious circle of inefficient production, high costs, little or no profits, and therefore no capital available for improvement of equipment. A bold move is required to break this circle, and perhaps an increasing demand for coal for ships may represent the first step whereby this can be accomplished—leading to greater prosperity in the coalfields, the consequent installation of electrical plant for mining purposes, and therefore the cheaper production of coal, which means a revival of the iron and steel and allied industries and a further increased demand for electrical plant and electrical power. A "snowball" of coal!

The I.E.E. Annual Report.

THE annual meetings of the Institution of Electrical Engineers for several years have been marked by a degree of placidity and contentment which, while it is eloquent of efficiency and prosperity, affords little scope for comment; even Mr. F. W. Purse, the candid critic of former years, has no ammunition and is fain to congratulate the Council on its work. The membership curve continues to ascend at practically the same rate as the average for the last five years, and the total is now well over 13,000—a remarkable achievement, accomplished in spite of losses by death and resignation or lapse amounting to 721 (mainly in the Student class). Unfortunately, there is a heavy death roll, especially in the Member class, including the names of many well-known pioneers.

Great activity prevails in all branches of the Institution; the Local Centres and Sub-Centres, and the eight Students' Sections, which have proved invaluable pillars of the structure, continue to develop and to maintain the rate of progress, and the proceedings of the Wireless Section and the Informal Meetings Section have been exceptionally successful. The outstanding feature of the session was certainly the joint meeting with the American Institute of Electrical Engineers, a new departure which literally makes an epoch in electrical history.

Since the meeting at which the report was presented, the Tothill Street property has been sold at a profit, and the final instalment of the mortgage on the Institution building has been paid off. The Institution is therefore in a particularly happy position, on which our congratulations are due to all concerned—including Mr. P. F. Rowell, the secretary, whom we were glad to see (unofficially) present at the meeting for the first time after his long and dangerous illness.

Mr. Hawes and the E.T.B.I.

IT is obvious from the small attendance at the annual meeting of the Electrical Trades Benevolent Institution, which took place on Monday last, that subscribers and donors are satisfied with the manner in which the Council and the Executive Committee have performed their arduous duties. We report the proceedings on another page, where it will be noted that there have been several changes in the *personnel* of the Council, while a secretary has been appointed (Capt. J. T. Keeping), who will be responsible for the great bulk of the secretarial work in future. We are sure that our readers will agree with us in regarding this particular time as appropriate for paying a high tribute to Mr. F. B O. Hawes, the honorary secretary, for the most excellent service that he has rendered to the Institution during so long a period. We are able from lengthy personal association with him in his early pioneering work in connection with the National Electrical Manufacturers' Association (which was transformed into the present B.E.A.M.A.) and the E.T.B.I., which originated from that movement, to testify to the enthusiasm, organising ability, patient investigation and tact which he so self-sacrificingly employed in those movements. What we owe him never has been and never can be adequately acknowledged—though it has been fully recognised and appreciated by those who have sat with him at work; therefore we take advantage of the opportunity which arises as he enters upon a period of less active responsibility, to pay him the highest tribute that it is in our power to give. The manifold duties of his office with the E.T.B.I. have been performed almost entirely as a labour of love, and we question whether any special service that anybody else has rendered to any department of the industry has been given with less thought of personal gain or aggrandisement. It is satisfactory to learn that though, owing to his manifold interests and the growth of the work of the E.T.B.I., he is no longer able to devote his time to the full secretarial duties, his special knowledge of matters will be at the disposal of the Committee, as he will continue to hold the office of honorary secretary.

The Alouette Hydro-electric Plant.

Some particulars of the new water-power station of the British Columbia Electric Railway Co. It is the first major plant in Canada to be automatically controlled completely from another station 12 miles away.

By FREDERICK H. FULLERTON.

THE British Columbia Electric Railway Co. has completed the construction of a 12,500-h.p. hydro-electric plant at Alouette, in British Columbia. While it is comparatively small so far as the horse-power developed is concerned and only cost $2,500,000, the station is nevertheless extremely interesting on account of the fact that it is automatically controlled from the Stave Falls plant of the Company situated approximately 12 miles away.

Fig. 1.—The Alouette Power House.

Automatic switching equipment has been used extensively on the American continent with a marked degree of success for a number of years past, but the Alouette generating stating is the first major plant to be completed with complete automatic control. It is located on the shores of Stave Lake, and the two stations are connected by a transmission line, the water flowing through the Alouette turbines being used again at the Stave Falls power house; when the Company erects its proposed power house at Ruskin, the water will be used for the third time in the development of hydro-electric power.

The construction of the new Alouette power station was completed in April, 1927, which date marked the thirty-first anniversary of the founding of the British Columbia Electric Railway Company, which supplies power to the lower mainland of British Columbia, including the cities of Vancouver, New Westminster and Chilliwack, and also to Victoria and a portion of Vancouver Island.

The equipment of the Alouette station consists of one vertical-shaft alternator rated at 10,000 kVA maximum, three-phase, 60 cycles, driven by a 12,500-h.p. Francis turbine which operates under static head varying from a normal low flow of 124 feet to normal high flow of 154 feet. The turbo-generator was supplied by the English Electric Co., Ltd., which sent an engineer from England to supervise the erection of the machinery. The exciting of the generator will normally be effected by a directly-connected set, but in case of emergency provision has been made by a spare waterwheel-driven exciter. Power will be generated at 6,825/7,500 volts and stepped up to 60,000/63,000 volts for transmission to the Stave Falls plant, at which point it will be connected with the lower mainland B.C. system. Provision has also been made for the Alouette station to be operated by hand in case of an emergency when no voltage would be available at Stave Falls for opening or closing the circuit breaker.

The Alouette project was conceived by the Burrard Power Co., Ltd., in 1907, and when that Company was taken over by the British Columbia Electric Railway Co. in 1910, the scheme was under active consideration. The Western Canada Power Co. was taken over by the B.C. Electric Railway Co. in 1921, and with the addition of the Stave Falls plant to the Company's holdings, it was decided to considerably revise the original Alouette

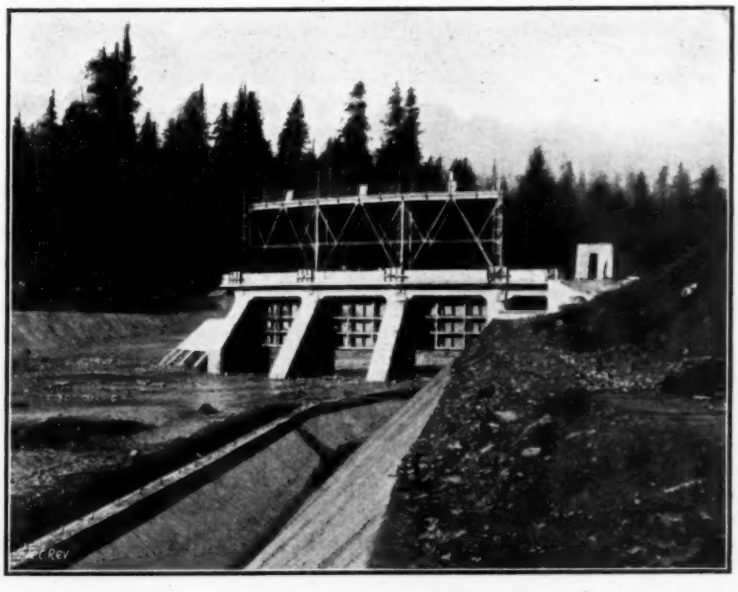


Fig. 2.—Gate of Spillway.

scheme. The site is located about 25 miles due east of Vancouver, and the initial step taken was to connect a small logging railway in the district with the Canadian Pacific system at one end and extend the line until it

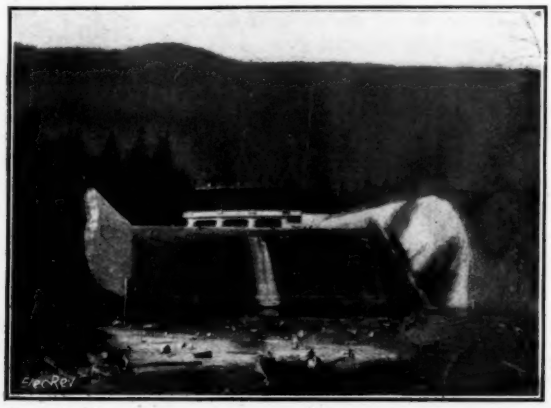


Fig. 3.—Ogee of Power House.

reached the scene of construction at the other end. A roadway was also constructed by the Company. The draining of the Alouette Lakes is performed by the Alouette River, which flows for 16 miles south-west before it discharges into the Pitt River at tidal elevation. The lakes are at an elevation of 140 ft. above Stave lake, equivalent of 3,700 ft. main sea level. There are two Alouette lakes, which were separated by a very short stretch of running water, but when their levels were raised they converged into one. A dam was erected at the outlet and a tunnel driven to connect with Stave lakes, the waters diverted through it being used to operate the power plant on the shores of Stave lake.

Preliminary work on the Alouette dam was commenced in October, 1925, and completed in February, 1926, under contract valued at approximately $500,000 by the Pacific Engineers, Ltd., of Vancouver. For the construction of the tunnel two gangs started boring from the Stave Falls end in July and from the Alouette end in October, 1924, and the two headings met in May, 1925. The erection of the power house was commenced in July, 1926, the contract including the construction of the building itself and the driving of the penstock tunnel. The erection of the transmission line connecting the Alouette and Stave Falls plants across rugged, mountainous, and forbidding country, presented an extraordinarily large number of difficulties to the contractors; nevertheless, the job was completed in record time: in all, 127 holes 6 ft. deep were dug, 78 of them having to be blasted from solid rock, and the standard-type transmission wire was strung from cedar poles. The line is a three-wire copper circuit, and a two-wire telephone circuit is also carried on the same poles, but on separate cross-arms.

The automatic plant starts to operate whenever the connecting transmission line is energised: the penstock valve is opened by means of a motor that is operated automatically from Stave Falls; when the pressure is built up the brakes are released and the turbine gates start to open, thus causing the machinery to commence functioning; as the generator develops speed, the exciter also builds up voltage which in due course is applied to the generator field. It is essential that the design of the turbine and governor be such that the waterwheel will accelerate slowly as it approaches synchronous speed; the automatic synchronising equipment takes control of the speed of the machine and at the proper time closes the oil-immersed circuit breaker, which connects the generator to the energised line; the machine will then take load in accordance with the governor setting and the system frequency.

The automatic switchboard equipment of the Alouette plant was supplied by the Canadian General Electric Co. The construction work was carried out under the

Fig. 4.—Automatic Switchboard.

supervision of Mr. E. E. Carpenter, construction engineer of the British Columbia Electric Railway Co., while the actual work at Alouette was under the supervision of Mr. H. Irvine, resident engineer.

New Automatic Sub-stations.

Three Sub-stations recently inaugurated at Brighton are equipped with the joint Reyrolle and Bruce Peebles apparatus for automatic and "Centrovisory" control.

In our issue of September 19th, 1924, p. 421, reference was made to the inauguration of the first of three automatic and supervisory control sub-stations of the Brighton Corporation electricity undertaking, which were to complete a scheme for supplying the d.c. network by means of motor convertors. This sub-station (Kemp Town) was also visited during the I.M.E.A. Conference at Brighton in 1925 (Electrical Review, June 26th, 1925, p. 1011).

The scheme has now been completed and in operation for some time, and on May 16th there was an official inauguration of the sub-stations by the Mayoress of Brighton, Mrs. C. Kingston.

The complete system of "Centrovisory" and automatic control embodies the joint production, "automatic service equipment," of Messrs. A. Reyrolle and Co., Ltd., and Messrs. Bruce Peebles & Co., Ltd., which was described fully in our issue of October 24th, 1924, p. 606.

The three new sub-stations, known as Preston Park, Lewes Road, and Kemp Town, are situated in public parks and recreation grounds under the administration of the Parks and Gardens Committee, and are controlled from the main sub-station at North Road. The control room in this sub-station, fig. 1, contains eight "Centrovisory-control" pedestals fitted with push buttons and the necessary instruments for regulating eight machines, which are distributed as follows:—

Preston Park sub-station, two 500-kW and one 1,000-kW motor convertors; Lewes Road sub-station, two

500-kW and one 1,000-kW motor convertors; and Kemp Town sub-station, two 500-kW similar machines. Two high-pressure feeders are run to each sub-station, and in the same trench there is a multicore pilot cable for connection to the "Centrovisory-control" apparatus. By means of the pilot wires, each machine in the sub-station, with all its indicating, recording, metering and alarm apparatus, can be separately and completely controlled.

The sub-stations are roomy and well lighted, and the plant is so arranged that every detail is easily accessible. The provision of adequate basements enabled the cable work to be neatly carried out. A pleasing and effective method of artificially lighting the sub-stations is provided by means of lanterns mounted on standards, which may be readily moved to new positions when required. The sub-stations are generally similar to each other in their lay-out. The h.p. metal-clad switchboard is erected across one end, with the d.c. switchboard and automatic control panels at right angles to it down one side. The machines are arranged in line down the centre of the sub-station, so that simple cable runs are ensured.

The motor convertors are of Messrs. Bruce Peebles's standard La Cour type, equipped with their automatic short-circuiting gear and with bearing and machine temperature-indicating devices of Messrs. Reyrolle's standard pattern. The 500-kW sets run at 750 r.p.m., and the 1,000-kW sets at 500 r.p.m. The whole of the main switchgear and automatic "Centrovisory-control" equipment is of Messrs. Reyrolle's manufacture. The main switchgear, which is of the makers' compound-filled metal-clad horizontal draw-out type, controls the feeders and motor convertors. The convertor circuit-breakers are operated by 3-phase motors, the supply for which is taken from potential transformers incorporated in the switchgear. The automatic equipment is of particularly neat and robust design. The push-button switches on the "Centrovisory-control" pedestals are mechanically interlocked to ensure correct sequence of working, and specially designed to prevent inadvertent operation. The relay units used in conjunction with the push-button switches are of simple construction and are enclosed in dust-proof metal cases with glass fronts, giving a full view of the operating parts and contacts. They are mounted on slate panels erected by the side of the d.c. boards.

There are two relay panels to each machine, one working in conjunction with the "Centrovisory" system and the other serving for the automatic operations. The automatic panel is equipped with a "master" unit, a simple motor-driven machine which holds a time-control over the whole sequence of operations during starting and stopping. Fig. 2 shows one pair of the relay panels at the Lewes Road sub-station. The synchronising and choke-coil contactors are in the main circuits and oil immersed. They are provided with handles for hand operation, when necessary, by the inspecting and testing staff, and are mounted, with a voltmeter, on a neat pedestal standing between the machine and the control board in the sub-stations. Synchronising is carried out by the Bruce Peebles patented method, and the starting resistances and choke coils for this purpose are accommodated in the base-ment. Fig. 3 shows the interior of the Kemp Town sub-station. The d.c. switchgear in each sub-station was supplied by Messrs. Bertram Thomas. It is interesting to note that the capital cost of the three sub-stations amounts to about £12 per kW.

We are indebted to Mr. J. Christie, M.I.E.E., the electrical engineer and manager to the Brighton Corporation, for the accompanying illustrations.

Fig. 1.—Control Room at North Road Sub-station.

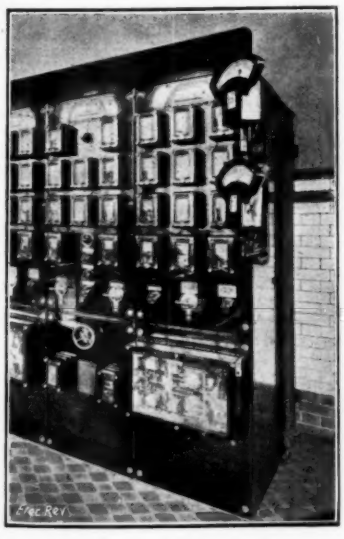


Fig. 2.—Automatic and "Centrovisory" Panels.

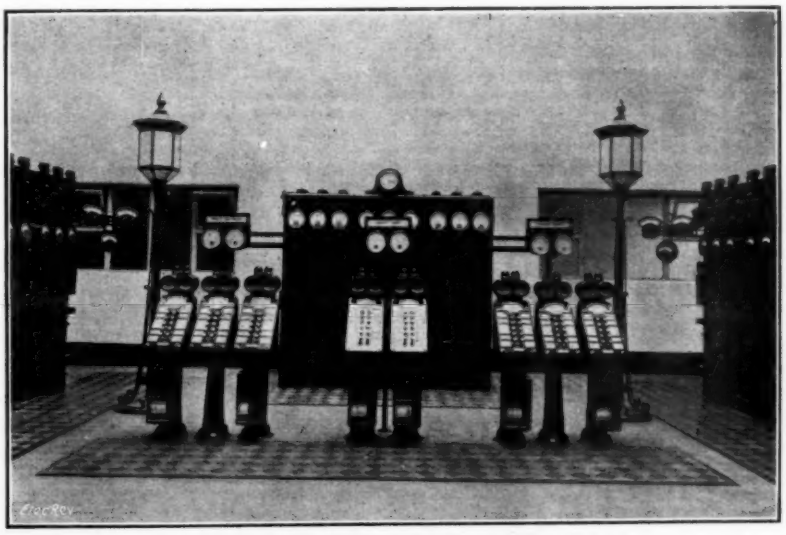


Fig. 3.—Interior of the Kemp Town Sub-station.

"Beam" Wireless Telegraphy.—I.

An investigation of the theory underlying the "beam" aerial system: this involves two principles, *viz.*, the directional effect of spaced transmitting aerials, and the reflection effect of free aerials suitably situated with respect to the transmitting aerials.

By N. WELLS, M.Sc.

THE basis of the Marconi "beam" radio-telegraph transmitter is the aerial system; this comprises two rows of vertical antennæ, and when one of these rows is excited in such a manner that the component aerials are in phase and radiate with equal intensity, the system as a whole possesses marked directional properties. The method is due to Mr. C. S. Franklin, who was the first to apply the theory, calculate the directional effect and energy magnification possible under various conditions, and develop the necessary feed system, together with the valve transmitting circuits. A schematic diagram of the feeder circuit and aerial is reproduced in fig. 1, while fig. 2 is a view of one of the stations erected in England by Marconi's Wireless Telegraph Co., Ltd.* In the present article no attempt is made to describe the numerous difficulties encountered in a task of such magnitude, nor to disucss the thorny subject of short-wave propagation.

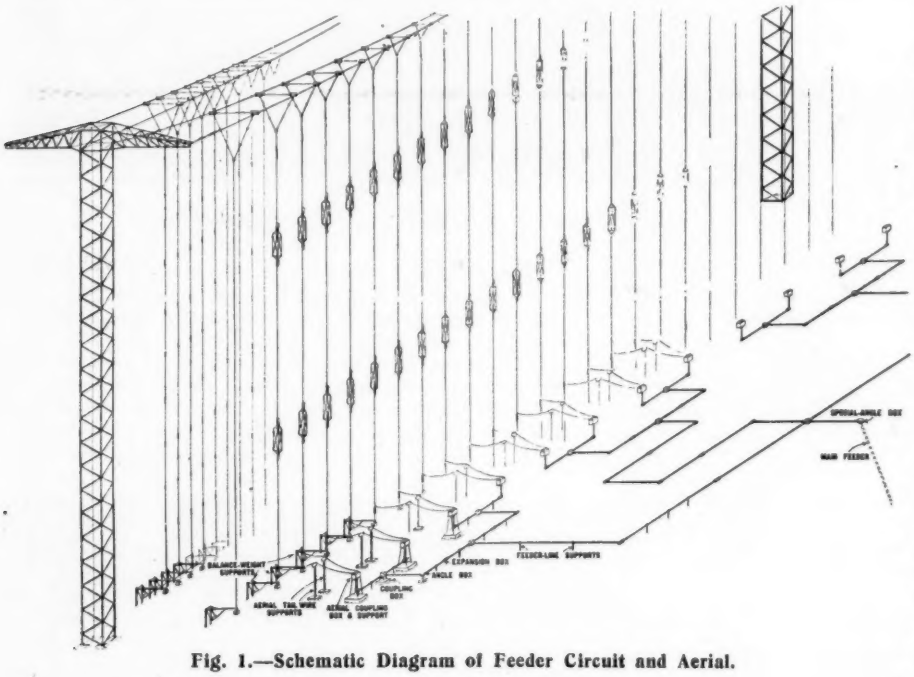


Fig. 1.—Schematic Diagram of Feeder Circuit and Aerial.

Transmitting System of Aerials.

The transmitters are evenly spaced vertical aerials extending horizontally to some multiple of the wavelength; if they are excited in the same instantaneous phase and evenly fed, the entire row functions as a unit and will radiate mainly fore and aft. An idea of the field intensity through 360 deg. in the case of a row of aerials four wave lengths wide is furnished by fig. 3.

Principle.—To understand the underlying principle, consider electric force in any direction to be indicated by a travelling vector possessing two motions, the first a displacement in the direction under consideration, the other a rotation of the vector about its own origin, with an angular motion equivalent to one rotation per wavelength travelled. At any point in the path of the vector the total rotation will be an indication of its phase relative to the point of starting out.

Next, consider the case of a row of transmitters, four wave-lengths wide, represented in plan by fig. 4, in which the aerials are shown as dots extending from A to B. Let S indicate a distant receiving station whose direction O S is normal to A B. Since S is at a distance, all lines emanating from A B and pointing towards S may be regarded as parallel, so that vectors starting out in phase from points along A B reach S in phase; thus for transmission towards S the effect will be that of the simple addition of all vectors representing electric force in that direction.

If, however, the position of S be shifted through 90 deg. to S_{AB}, where it is in line with A B, the argument will be different. Consider any vector starting from A on its journey to S_{AB}; after moving through one wave length it reaches P, a quarter of the way from A to B, and has made one complete revolution; this implies that, relative to a vector starting from P at the instant of A's arrival, A lags 360 deg. in phase (fig. 5). Now consider vectors starting at the same instant from points evenly spaced between A and P: clearly they pass P at angles evenly divided between 360 deg. and 0 deg.; thus, at any instant there is at P a collection of vectors directed evenly through 360 deg.; but this is a state of balance, and therefore there is no effect in the direction A B as far as P (fig. 6). In the same manner, if we consider vectors arriving at O, Q and B (points two, three, and four wave-lengths along the system), we will find collections two, three, and four times as numerous, which balance out. Thus, the effect of synchronised radiation along the line of aerials A B is to cancel out radiation in the direction A B.

Other Directions.—The above result may be restated as follows: in the case of a four-wavelength system, considered in the direction of its length only, there is a difference of 4 × 360 deg. in phase between the extremities A and B. Extending the argument to positions of the receiving station varying between S and S_{AB}, we may reasonably conclude that the phase difference between vectors arriving from the extremities will vary from 0 deg. when S is normal to 4 × 360 deg. when S is in line with the aerials. It follows that there will be positions of S where the phase difference between the extreme vectors amounts to 1, 2, 3 and 4 times 360 deg., and that at such positions the sum of the complete system of vectors balances out and no energy arrives.

* For descriptions of stations see ELEC. REV., January 15th, October 29th, and November 5th, 1926, and April 22nd and September 9th, 1927.

We have agreed that for certain directions of s there is zero radiation; it follows that between these minima there must be directions along which the vector forces add to a maximum. When s is normal to A B, the phase difference between the A and B vectors is 0 deg., and the intervening vectors add together simply; this is the first, or main, loop maximum. When s is at such an angle s o s′ that the phase difference along o s′ amounts to 360 deg., the resultant vector force will have diminished to the first zero; between s and s_{AB} there are three maxima and three more minima, corresponding with three side loops. If we draw a curve such that the length of the line intercepted between the origin and boundary in any direction is proportional to the resultant force in the same direction, we obtain a polar curve of field strength. That part of the curve known as the main loop is bounded by the first zeros on either side of the origin. Both from analysis and from actual measurements it is known that

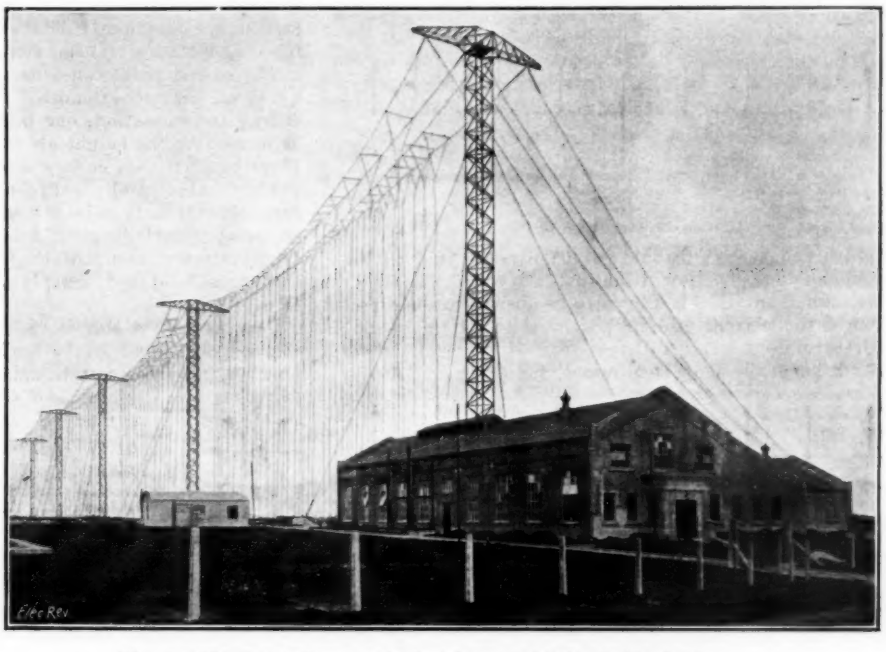


Fig. 2.—Marconi " Beam " Radio-telegraph Station in England.

Fig. 3.

the energy in the side loops is insignificant, and therefore the main loop, or " beam," is the only feature that we need consider.

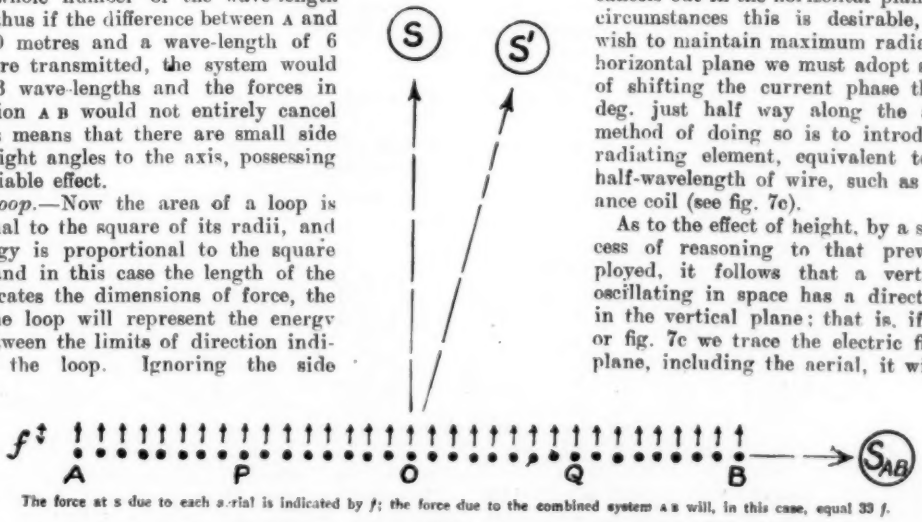
In some cases the aerial system may not extend to a complete whole number of the wave-length adopted; thus if the difference between A and B were 20 metres and a wave-length of 6 metres were transmitted, the system would extend 3.3 wave-lengths and the forces in the direction A B would not entirely cancel out. This means that there are small side loops at right angles to the axis, possessing no appreciable effect.

Main Loop.—Now the area of a loop is proportional to the square of its radii, and since energy is proportional to the square of force, and in this case the length of the radii indicates the dimensions of force, the area of the loop will represent the energy output between the limits of direction indicated by the loop. Ignoring the side loops, the main loop may be regarded as representing all the energy output: if we assume this to be constant for varying widths of system, the area of the main loop will be constant whatever its shape. It will be shown later that for a given wave-length, the wider the aerial system the narrower the loop, or " beam," and, since the total " beam " energy is constant, the narrower the " beam " the greater will be the concentration of energy in the normal direction. The direction of the first zero gives a fair idea of the narrowness of the main " beam."

Height of System.—With reference to the heights of transmitting and reflecting aerials, a straight wire free in space will oscillate to a frequency whose wave is approximately twice the length of the wire, while the current and potential distribution will approximate to the sine form depicted in fig. 7a. If we now double the length of wire and force it to oscillate to the original frequency, the current and potential distribution will be as indicated in fig. 7b. It is apparent that the current flow along one half is of opposite sign to that along the other; thus radiation from the upper half is in antiphase with radiation from the lower half, and cancels out in the horizontal plane. In some circumstances this is desirable, but if we wish to maintain maximum radiation in the horizontal plane we must adopt some means of shifting the current phase through 180 deg. just half way along the aerial; one method of doing so is to introduce a non-radiating element, equivalent to an extra half-wavelength of wire, such as an inductance coil (see fig. 7c).

As to the effect of height, by a similar process of reasoning to that previously employed, it follows that a vertical aerial oscillating in space has a directional effect in the vertical plane; that is, if in fig. 7a or fig. 7c we trace the electric field in any plane, including the aerial, it will take the form of a polar curve, whose major axis lies on the horizontal plane bisecting the aerial.

Vertical Polar Curves.—In order to picture the nature



The force at s due to each aerial is indicated by *f*; the force due to the combined system A B will, in this case, equal 33 *f*.

Fig. 4.

of the directional effect in the vertical plane, consider first the hypothetical case of an elemental aerial radiating in free space a wave many times (say ten) its own length; during each oscillation the current amplitude will vary from zero to maximum, but, owing to the comparatively restricted length of the element, the

Path of a single vector from A through one wave-length towards B_{AB}

Fig. 5.

amplitude at any instant will be practically uniform from end to end. Now, from the theory of the Hertzian oscillator, radiation is known to be normal to the direction of the current and proportional to its amplitude; therefore in the case of the vertical element whose length generally may be ignored, the energy of radia-

Relative positions of instantaneous vectors between A and P.

Relative instantaneous positions of vectors passing P towards B_{AB}

Fig. 6.

tion will be of maximum intensity in the horizontal plane bisecting the element, while in any other direction the intensity will be in simple cosine relation. In other words, we consider the vertical element as a polarised system whose length is so small as to have no practical effect on phase difference, and therefore if F represents the maximum force due to radiation, it will be the force in the horizontal field of the element, while $F \cos \theta$ will be the magnitude of the force acting at an inclination θ. This cosine polar curve, though hypothetical as to origin, may be treated as the basis of vertical polar curves given under actual conditions. If the element is extended until it is one half wave-length long, the actual length of the system must be considered as affecting phase differences along any direction other than the normal, but the resultant polar curve (fig. 8b) is only slightly sharper than that of an elemental aerial, because while on the one hand the length has been appreciably extended, yet on the other hand current distribution has changed from practically uniform to definitely sinusoidal.

If, however, we extend the half-wave aerial until it is twice as long, we will have also doubled the effective length, since the sinusoidal form of distribution remains unchanged (compare figs. 7a and 7b); as will be shown later, there is now twice the flow of energy along the horizontal plane bisecting the aerial, with a corresponding diminution of intensity in other directions (fig. 8c).

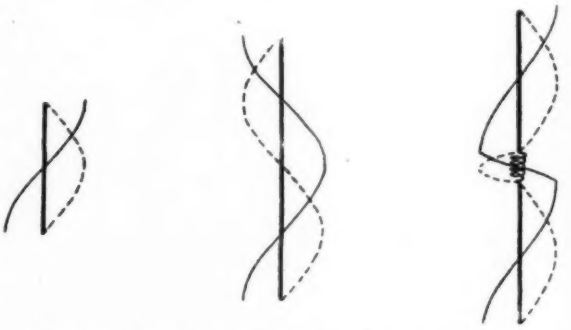
There are two other points to notice: the effect of the earth's resistance is probably such that an aerial close to the earth may be regarded as possessing a negative image at an equal distance below the earth's surface, provided the form of aerial is such as to radiate mainly with an angle confined within 10 or 15 degrees to the horizontal. Current distribution along a Franklin aerial is such that the maximum intensity of radiation would be in the horizontal direction, but for the earth's proximity: the effect of this proximity is probably to give the plane of effective maximum intensity a slight upward tilt. The subject is still under investigation, but it is already clear that this form of aerial, or some logical modification, fulfils closely the best conditions for long-distance transmission.

The second point concerns the useful height to which an aerial may be extended. In addition to increasing energy concentration, one might regard such extension as increasing the height above the earth's surface of the plane of maximum energy intensity, and thus reducing ground absorption. Probably the most effective arrangement is to raise the active radiating element to some appreciable height, feeding it through a length of, comparatively, non-radiating wire; this gives effective height without too sharply defined vertical distribution.

Conclusion.—A simple vertical aerial radiates evenly through 360 deg. in the horizontal plane, but, as we now see, possesses directional properties in the vertical plane: *this effect applies equally to the system of aerials already possessing directive properties in the horizontal plane.*

Comparison of "Beam" System with Plain Aerial.

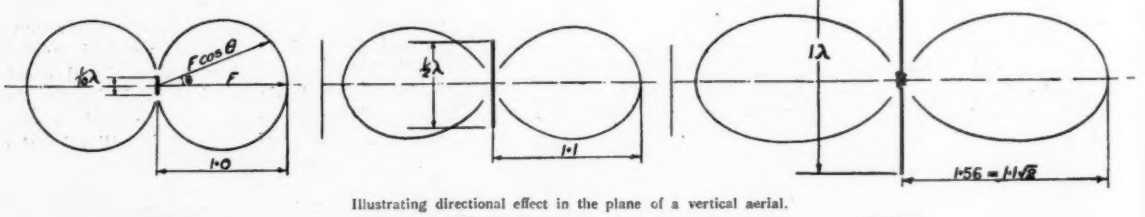
Compared to a single vertical aerial, the theoretical concentration of energy gained by employing a reflected "beam" is 6.0 times per wave-length in width of system.† The figure is arrived at by comparing the area of the polar loop for any particular "beam" system with the area of the polar curve for a plain vertical aerial



Dotted and full lines indicate current and potential distribution respectively.

Fig. 7a. **Fig. 7b.** **Fig. 7c.**

of similar form and height. The latter curve is a circle, since the single aerial radiates with equal intensity through 360 deg., and, since we presuppose signals of equal strength in the required direction, the radius of the circle coincides with the main axis of the loop (fig. 9).



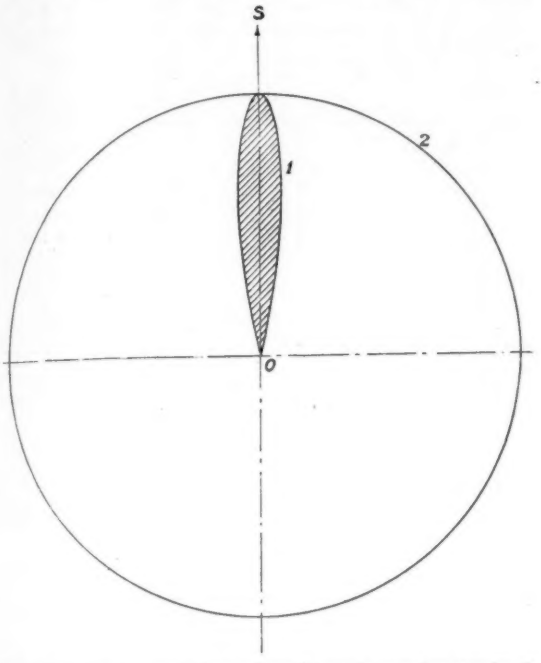
Illustrating directional effect in the plane of a vertical aerial.

Fig. 8a. **Fig. 8b.** **Fig. 8c.**

The total energy will be proportional respectively to the areas of loop and circle, and it is found that a "beam" polar loop has approximately 6.0 times less area, per wave length in width of system, than the circle. Thus, the theoretical gain for a "beam" sys-

† This subject will be discussed in Article II.

tem four wave-lengths wide, will be in the neighbourhood of 4 × 6.0, say 24 times. If a similar system is employed at the receiving end, the figure becomes 24 × 24, or 576 times. The gain in field strength will be in



Comparative polar curves: (1) for a reflected "beam" system four wave-lengths wide directed towards S; (2) for plain vertical aerial of similar height radiating same intensity of energy towards S; an equal intensity is radiated through 360 deg.

Fig. 9.

proportion to the square root of the intensity of energy, and in the latter case would approximate to 24. Under practical traffic conditions over long distances the actual gain is about half that indicated by the theoretical figures.

A feature of short-wave transmission is the extraordinary fluctuation in signal strength that occurs during twenty-four hours, and it is often in this connection that the advantage of the "beam" aerial lies, for while signals obtained from a broadcast receiving aerial may be quite strong one minute and inaudible the next, the magnification due to a "beam" aerial working under similar conditions yields a minimum strength of signal sufficient to maintain high-speed traffic over the whole working period. In the reverse case, that of transmitting aerials, the writer had an interesting experience when working on the Rio de Janeiro to Europe service; signals from the 50-kW station at Berlin were strong enough to work high-speed traffic over four hours, say from 13.00 to 17.00 G.m.t., when receiving on a Marconi "beam" aerial at Rio, whereas during the same period of the year the 15-kW "beam" transmitting station at Dorchester, employing a similar wave-length of 15 metres, was good for high-speed traffic for twelve hours, say from 10.00 to 22.00 G.m.t. When broacast reception was employed the practical high-speed period in both cases was cut down to about one sixth.

Reflection.

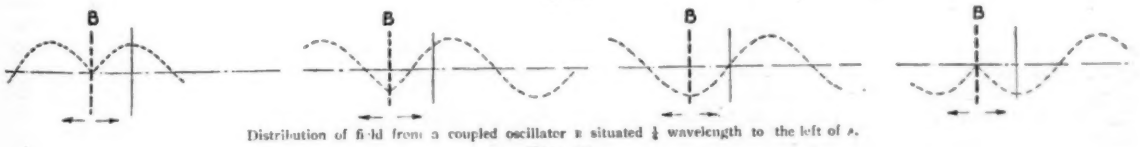
This subject may be studied by tracing the radiation of waves from a plain vertical aerial: in the actual region of the aerial the electrostatic and electromagnetic fields are probably complex, but for the present it may be assumed that they follow the simple harmonic law. Confining ourselves at first to the electrostatic effects, as slightly easier of treatment, we shall examine three stages in the development of the field of force during one half period. In fig. 10 the sine curves depict phase, sign, and magnitude in the usual manner for the field of force radiating from a simple oscillator A, while the arrows indicate the directions of propagation. If another and similar aerial, B, be situated one-quarter wave-length behind A, say in the position indicated by the vertical dotted line, the impinging wave from A will excite it into oscillations. These lag 180 deg. on the phase of the incident wave, following the law of coupling for two freely oscillating systems. It will be observed that the incident wave is travelling from right to left, and in order to depict correctly the 180 deg. shift in phase, we must first consider the wave radiating from B in this direction, that is, the wave to the left of B: thus, the dotted sine curves indicating the three stages of the electric field should first be drawn to the left of B, after which the curves to the right follow by symmetry.

Retracing our steps, we have first a 90 deg. lag in phase due to the quarter wave-length of separation between the aerials, and secondly a 180 deg. lag at B; next, following the wave back to A, there is a final 90 deg. lag due again to the distance, so that on returning to A, the total lag amounts to 360 deg.: this means that the reflected wave is similar in both phase and sense to the wave radiating from A towards the right, and adds to it. By similar reasoning it will be found that waves to the left of B cancel out, B thus reflecting back the field radiated towards it.

This may be treated graphically by combining the two fields, as has been done in fig. 11. To the right of A it will be seen how the two fields are of similar sign

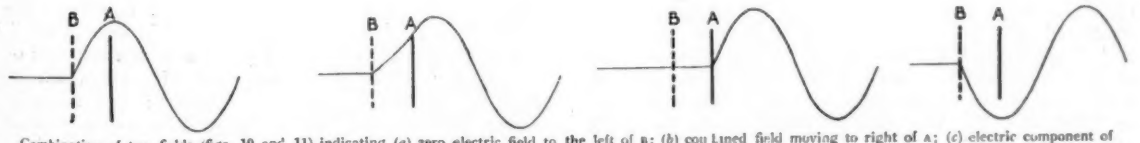
Distribution of electric field during one half cycle of propagation.

Fig. 10.



Distribution of field from a coupled oscillator B situated ¼ wavelength to the left of A.

Fig. 11.



Combination of two fields (figs. 10 and 11) indicating (*a*) zero electric field to the left of B; (*b*) continued field moving to right of A; (*c*) electric component of "standing" wave between B and A.

Fig. 12.

and sense, and so add, while to the left of B it is apparent that fields, though moving in the same sense, are of opposite sign and thus cancel out. Now the same line of argument applies equally to the electromagnetic field, and so we may reasonably conclude that twice the original intensity of energy is transmitted in line with AB ahead of A, while no energy is transmitted in line with BA behind B.

Experimental evidence is closely in accord with these theoretical deductions, but it is necessary to add that since there are ohmic and other losses at B, the amplitude of the reflected wave cannot be quite equal to that of the incident wave; hence there will be imperfect reflection and a certain amount of leakage, yet the efficiency of a carefully-designed reflecting system is remarkably high.

"Standing" Waves.—It is interesting to consider what occurs between A and B: examine carefully the four sketches of fig. 12; clearly the directions of the two fields are equal and opposite, and cancel out as regards horizontal displacement between A and B. On the other hand, at A there is a field which alternately rises to the maximum positive value and falls to the maximum negative value, the amplitude being twice that of the original field; again, at B the field values are always equal and opposite and cancel out, so that there is a stationary node. Between B and A there is thus an alternating field, commencing with zero value at B and increasing to the maximum, or loop, at A. Such a condition is known as a "standing" wave, or more accurately, in this case, a "standing" quarter wave.

Application to the "Beam" System.—Returning, however, to the main issue, that of reflected waves, the argument followed is valid only for the direction A B, in the line of the aerials; but a row of reflectors, similar in all respects, follows the law for spaced aerials that we have already examined, so that if A and B are now considered to represent the end elevation of a row of transmitting and reflecting aerials respectively, the field between the A and B rows may be treated as mainly confined to the direction A B at right angles to either row. In other words, if a row of transmitting aerials, projecting a fore and aft "beam," is spaced one-quarter wave-length in front of a similar row of suitably proportioned reflectors, the aft "beam" will be reflected into and combine with the forward "beam."

The Royal Society's Soirée.

Annual Exhibition and Demonstrations.

FARADAY interested himself greatly at one time in the study of the crispations formed on liquids lying on vibrating surfaces, and the account of his conclusions occupies considerable space in his laboratory notes, which have not been published. Many of his beautiful experiments were described in a paper presented to the Royal Society in 1831, and the effects were re-examined in 1883 by Lord Rayleigh, who showed that Faraday's original interpretation, which had been disputed, was correct. The fact that the experiments seem to have been rarely repeated, added to the interest shown in the demonstration arranged by Sir William Bragg, K.B.E., F.R.S., last week at Burlington House.

The occasion was the annual conversazione of the Royal Society on May 17th, when Sir Ernest Rutherford, O.M., president, welcomed Fellows and guests. Some 26 exhibitors, six more than last year, provided the customary display in the library.

The National Physical Laboratory (Dr. W. Rosenhain, F.R.S., and Mr. W. E. Prytherch) showed a radiator and high-temperature furnace in which heat is generated by electrical contact resistance between cylindrical, spherical, or annular pieces of carbon or graphite. The characteristic and novel feature is that the carbon resistor is protected from oxidation by being enclosed in a refractory tube, or sheath, fitting the resistor loosely, and sufficiently impervious to prevent rapid diffusion of gases. The air in the tube is quickly converted into a mixture containing carbon monoxide and dioxide, and the renewal of oxygen from outside is very slow, so that there is no appreciable burning even after weeks of exposure at temperatures as high as 1,300 deg. C. The ends of the resistors are made of solid pieces of carbon or graphite, thus securing a comparatively cool end for which artificial cooling is not needed. The resistor may also consist of rings or of spheres regularly packed between two concentric tubes.

One of the most fascinating demonstrations was that of an optical interference method of observing modes of vibration of piezo-electric quartz resonators (Dr. D. W. Dye, F.R.S.). The quartz plate has its upper surface plane and polished; a flat glass surface is supported close to, and just above, the quartz plate. This surface can be brought to approximate parallelism with the quartz plate, and interference bands are then seen under illumination from a mercury vapour arc. An alternating electric field can be applied to the quartz plate, and when the frequency is adjusted to correspond with one of the modes of vibration of the plate, the interference bands are cut up to correspond with the nodes and anti-nodes of the plate.

The Cambridge Instrument Co., Ltd., had on view apparatus which has been developed in conjunction with the British Research Association for the Woollen and Worsted Industries, for maintaining constant the humidity of the air in rooms where hygroscopic substances, such as textile materials, tobacco, paper, &c., are being tested or stored. A hair hygrometer in which a light pointer, carrying two small thermocouples arranged differentially, is caused to move in accordance with the variations in length of a hair due to fluctuations in the humidity of the surrounding air. When the humidity alters, the pointer is moved in such a way that one of the thermocouples is brought opposite a small electrically-heated coil, thus setting up an electromotive force which energises a moving-coil relay that is in turn connected, through additional relays, to mechanism which regulates the supplies of moist and dry air to the chamber under control.

Mr. E. B. Moullin exhibited an ammeter which can be calibrated by a steady current, designed for measuring currents whose frequency is about thirty million cycles per second, such as are employed in the "beam" system of radio communication. Its action depends on measuring the force between two circular cylinders carrying oppositely directed currents: the force increases slightly with the frequency because the current in the cylinders departs from axial symmetry and increases along the length of the system. The ammeter is a simplified current balance whose geometrical configuration has a form for which the various magnetic and electric fields are capable of exact solution. The system is two long circular cylinders placed symmetrically within a circular screen tube, so that the longitudinal and transverse current distribution is calculable, and hence the correction factor for any frequency may be derived. In the instrument exhibited the force at 3×10^7 cycles ($\lambda = 10$ m.) exceeds the force for the same steady current by 6 per cent.; full deflection is pro-

duced by 1.2 A, and the power expenditure at 3×10^7 cycles is less than one watt.

Sir Robert Hadfield, Bt., F.R.S., lent specimens which illustrated the properties of ferrous alloys and special metallurgical processes, including a machineable non-magnetic steel possessing a high yield point, *i.e.*, over 30 tons per sq. in., and therefore of value to the electrical industry for such purposes as the support rings of the armatures of turbo-alternators.

The radiological branch of the Government Research Department, Woolwich, showed a combined spectrometer and X-ray tube for taking four spectrograms at once; also some Debye-Scherrer spectrograms of oriented electro-deposited nickel, together with a model that illustrated the way in which the various reflections occur.

The Marine Biological Association of the United Kingdom, Plymouth, exhibited Dr. H. H. Poole's submarine photo-electric photometer, which apparatus has been used on the Association's trawler *Salpa* by Dr. W. R. G. Atkins throughout the year. The photo-electric current is measured by a potentiometer, using an interrupter, condenser, and a thermionic valve amplifier, with a telephone to indicate the null point, since a galvanometer cannot be used on a trawler. The drop in potential is measured across a 100,000-ohm resistance; accordingly, one scale division corresponds to 1×10^{-9} ampere; the instrument is sensitive to half a division under optimum conditions. The photometer for use in air contains a vacuum potassium photo-electric cell, a similar cell being mounted in the submarine photometer, which is lowered under water, or a gasfilled cell for work in deeper water. The photometers have been used down to 40 and 70 metres, respectively, in order to measure the amount of light that penetrates the sea, light being, of course, the determining factor in under-sea life.

The Department of Mineralogy of the British Museum (Natural History, Dr. L. J. Spencer, F.R.S.) demonstrated the fluorescence of minerals when exposed to ultra-violet rays with the aid of an analytic quartz lamp lent for the occasion by the British Hanovia Quartz Lamp Co., Ltd.

Lord Rayleigh, F.R.S., has found that when the "eye" of the peacock's tail feather is exposed to ultra-violet rays from a quartz mercury-vapour lamp, the colours become less brilliant, even after an hour's exposure at a distance of 3 inches; along with the loss of brilliancy there is often a change of tint. These effects are complex, and the tint depends on the angle of incidence: the most obvious interpretation of the experiment is, however, that the colours are due to pigments rather than to interference, though the latter view has of late been more in favour. In some cases a blue colour is developed, which seems to be due to the destruction of an overlying green. Long exposure destroys the colour altogether, leaving only the black background. The dark blue of the centre of the "eye" pattern is the most easily destroyed. A mercury lamp in glass was used to show up the colours, distinguished from the quartz lamp that was used to produce the fading.

The International Standard Electric Corporation's apparatus for measuring the resistance of cable dielectrics to the flow of air, or of impregnating compound, attracted attention. The ends of a short sample of single-core cable are sealed by conical caps, one of which is fitted with a pipe connection so that a partial vacuum may be applied to the core. The constant pressure under which flow takes place is measured by a manometer, and an aspirator is used to draw the air through so that the quantity may be measured. For the flow of oil a vacuum pump is employed, the quantity of oil flowing being received in a measuring cylinder.

The Corporation also exhibited a novel machine designed for investigating probability problems associated with the subject of automatic telephone traffic; it was set up to demonstrate the (*a*) determination of the distribution of telephone traffic in a group of ten fully available trunks hunted for in a definite order, and (*b*) determination of the distribution of telephone traffic in two groups of ten trunks with various grading conditions, including direct, reversed and mixed. The object of the device is to indicate the number of trunk lines required to deal satisfactorily with a given amount of traffic; it reproduces telephone conditions in a tangible manner, the same results being otherwise obtainable only by very abstruse mathematical calculation.

Contracts of Service.

Dismissal and the Right to Sick Pay.

By W. ERIC JACKSON, LL.B., Barrister-at-Law.

THE legal relationships of master and servant are changing year by year. Not only do the numerous industrial laws of to-day contribute towards this change, but the customary terms of service are also altering with modern conditions.

There was a time when a servant was almost as much his master's possession as was a horse or a dog. The master was responsible for everything that the servant did; medical attendance and food had to be furnished at the master's expense, and the servant was so much under the master's control as to be in what we should consider to-day a state bordering upon slavery.

Some remnants of this ancient relationship still exist. In domestic service they are more marked than elsewhere, but in all trades there remains the general legal principle as regards the payment of wages. In general, the rule is that the temporary absence of the servant from his normal duties owing to illness does not put the contract between master and servant at an end. Consequently the promise by the master to pay wages monthly or weekly remains good, and the servant can claim his wages even though by illness he cannot perform his own part of the contract.

This rule of law has been brought home with some degree of shock to employers in certain trades where claims have recently been made by servants for sick pay, and the Courts have upheld the servants' claims. It may seem unfair that an employer should be made to carry out his contract to pay wages while the servant is not compelled to give any compensation to his master for the services which his illness prevents him from rendering.

It is, of course, otherwise when the servant deliberately and without any reasonable excuse breaks his contract of employment by leaving without giving his employer notice. This fact was not only brought home to employés during the general strike, when the sudden unwarranted refusal to work involved many servants in liability for damages to their employers, but the Courts have decided that a mistress whose maid leaves without giving notice is quite entitled to claim a month's wages from the servant as damages, just as the servant can claim a month's wages if she is wrongly dismissed without notice.

A contract of service is a two-sided bargain like any other contract, and involves duties on both sides that

are complementary. But in the question of sick pay, it would seem that the law is a little one-sided, and confers a duty upon the employer which gives rise to no corresponding duty on the part of the servant.

This can only be explained from the original relationship of master and servant, where the master hired the servant generally and for no specific period, and took the risks of the servant's health, just as anyone hiring a horse or a house takes the risk of its being able to fulfil the function for which it was hired.

The general rule, then, is that a master who employs a servant on a "general hiring" is under liability to give sick pay. The right to sick pay exists only while the contract continues, and it should be remembered that a long and continued absence from work owing to illness will give the master the right to dismiss the servant without notice, and after the dismissal, of course, no sick pay can be claimed.

It cannot, however, be said to-day that the general rule applies in every case. A master is entitled to make with his servants whatever contract the parties can agree upon. And if the terms of service specially provide that no sick pay shall be claimable by the servant, the position is then quite clear. If the master gets the servant to sign on with a written agreement containing those terms, so much the better.

Unfortunately, masters do not usually make any such express terms with their employés. In order, therefore, to ascertain what the terms are, we must look to the conditions of employment, trade customs, and length of service, remembering that, in default of anything to the contrary, the Court will assume that the employment was a "general hiring," and that sick pay is claimable.

If the contract is for piece-work, or for the performance of some particular service—such as to dress a shop window or to clean the steps—obviously the payment for the services will not be payable until the work is done. And, if the employé through illness delays the performance, he cannot claim to be paid meanwhile; and if illness prevents his finishing it entirely, then he can only claim (if he can claim anything at all, which is doubtful) for as much as he has actually done.

Where there is a trade custom not to pay wages during illness, this trade custom will become part of the contract of service, and need not be expressly stated; but the custom must be so well known and so widely established that no workman could be supposed to be ignorant of it.

The difficulty about trade customs is that they vary in different parts of the country, and with different branches of the trade. What may be true of a cashier in a wholesale house may not apply to a shop assistant in a retail house. And mechanics in the motor trade may be bound by different customs from mechanics in the electrical trade. However, if the custom is clear, the parties will be bound by it.

As to length of service, it should be pointed out that a "general hiring" is for an indefinite period. The mere fact that wages are paid weekly or monthly will not necessarily displace the assumption that the hiring is "general." The period of payment will give an indication of the length of notice that should be given by either party on terminating the contract, but does not indicate the period over which this contract is to last.

There is a great deal of difference between a "general hiring with weekly wages" and a "weekly hiring." In the former, the contract lasts indefinitely until terminated by either party, and consequently sick pay will be claimable by the servant. In the case of a weekly hiring the contract ceases to exist as each week comes to an end. Accordingly, if the servant falls ill in the middle of the week, all the master need do is to pay him at the end of the week and cease to re-engage him at the beginning of the week following. The servant's contract thus terminates on the Saturday and is never renewed again, as it would be on the following Monday in the ordinary course if the servant presented himself.

Now, although the tendency of industrial conditions to-day is towards daily or weekly hirings with periodical re-engagements each following day or week, as the case may be, it cannot be said that employés such as carmen, clerks, shop assistants, errand boys, and packers are employed in this way.

In factories where employés are paid by the hour or day, and can be dismissed at any moment on short notice, no sick pay is claimable beyond the period of the hiring (day or week); but, in the case of office staffs or in retail businesses, where a certain degree of continuity in employment is necessary in order that the servant shall get to know his employer's business system, round of customers and list of prices, it cannot be said that the hiring is other than a general one. The type of work is not that of a factory where the duties are more or less mechanical and impersonal, and where no continuity of service is necessary in order to perform properly the duties of the employment. The servants other than those on the factory staff cannot therefore be deprived of their right to sick pay unless there is either (*a*) a trade custom not to pay sick wages, or (*b*) a special stipulation to that effect in the contract of employment.

Trade custom is altering year by year. The existence of National Health Insurance and Workmen's Compensation is gradually making it more common for employers to evade the payment of sick pay; and indeed, by the Acts of Parliament dealing with the matter, an employé who gets Workmen's Compensation is not entitled to his ordinary wages. And a servant cannot get both sick pay and unemployment insurance.

It is not strange, therefore, that the tendency of the trade customs should be towards substituting payments from the State for sick pay from the employer. Many employers to-day are making express stipulations with their employés that no sick pay shall be payable.

As regards servants already in the master's employ on "general hiring," the only thing that can be done is to terminate this general hiring and to substitute for it a general hiring without the right to sick pay. This can be done by giving each servant the requisite notice to leave, and by pointing out that he will be re-engaged on the same terms, but without the right to sick pay. Or a notice can be sent to each employé to the effect that after a certain day no sick pay will be given.

In cases where servants are engaged on "Trade Union conditions," these conditions will govern the case, and if they provide for the payment of sick pay, then payment at "Trade Union rates" will usually include sick pay unless the hiring is periodical (*e.g.*, from week to week, or day to day), and not general.

Power from the Sea.

In conjunction with Prof. Bouchersot, Mr. Georges Claude, the French scientist whose name is associated with a method of producing synthetic ammonia, hopes that it will be possible to generate power at low cost by utilising the difference of temperature between the surface of the ocean and water at a depth of some 6,000 ft. The Professor has completed tests with a small model turbine, the action of which is based on the above idea. According to the *Daily Mail*, the machine was run at 3,000 r.p.m., and a difference of temperature of 7.2 deg. F. was found to be sufficient to actuate it, whereas in the tropics the difference of temperature between the surface and the bottom of the sea is about 36 deg. F. It is stated that a power house is to be built at Havana, Cuba.

Some particulars of the system were given in the ELECTRICAL REVIEW of January 13th, 1928, p. 52.

Civil Service Commission.

Forthcoming examination for assistant examiners in the Patent Office.—Regulations and particulars can be obtained from the Secretary, Civil Service Commission, Burlington Gardens, W.1. July 12th is the latest date for receipt of applications.

Business and Industrial Notes.

The Week's Electrical Trade News from all Sources. Commercial and Industrial Developments, Business Changes, Market Prices for Materials, Trade Openings, New Publicity Literature, Liquidations and Failures.

Our New Telephone Number.

We shall be glad if all who have occasion to call up any of our Departments will note that the ELECTRICAL REVIEW telephone number has been altered to:

"CENTRAL 5871" (five lines).

Deed of Assignment.

J. H. HOLMES & Co., electrical engineers, and W. H. HOLMES AND SONS, paint and colour manufacturers, Newcastle-upon-Tyne.—As we reported in our last issue (p. 861,) the partners in these firms (Messrs. Alfred, John Henry, Ellwood, and Stephen Holmes) have been compelled to execute a deed of assignment for the benefit of their creditors. The trustees are Messrs. Joseph Miller & Jeffrey Taylor, Gibb Chambers, Westgate Road, Newcastle-upon-Tyne, and a meeting of creditors was to be held on Wednesday last. A *pro forma* statement of affairs shows total liabilities of £94,287, including £63,180 due to unsecured creditors, and £36,757 to partly-secured creditors (securities valued at £5,650). The estimated deficiency is £21,793.

Carliol House.

In the article upon the new headquarters of the Newcastle-upon-Tyne Electric Supply Co., Ltd., in our issue of May 11th, we stated that the interior wiring was provided by the Macintosh Cable Co., Ltd. Messrs. Gray Bros. (Newcastle), Ltd., inform us that the whole of the electrical installation was carried out by them. The main cables were manufactured by Messrs. W. T. Glover & Co., Ltd., while the small wiring for the lighting and heating points was manufactured by the Macintosh Cable Co., Ltd., and British Insulated Cables, Ltd.

An Australian Empire Exhibition.

The Prime Minister, Mr. Bruce, has introduced a Bill to authorise the holding of an Empire Exhibition in Centennial Park, Sydney, in 1932. The exhibition will be controlled by commissioners representing the Commonwealth and New South Wales, which are sharing the financial obligations. The estimated expenses are £1,250,000, and the estimated losses £500,000, which the Commonwealth will meet. Mr. Bruce said that the Wembley Exhibition had stimulated the interest of the British people in Australia and the other Dominions, and had helped trade relations within the Empire. The Imperial Conference held that great economic advantages had accrued to the Empire through Wembley. Therefore it was desirable to promote a chain of exhibitions at periods of a few years. The exhibits from any portion of the Empire will be free of Customs duty.—*Daily Telegraph.*

A "Met-Vick" Thrift Scheme.

Among the many ways in which the Metropolitan-Vickers Electrical Co., Ltd., looks after the welfare of its employés, apart from the business side, is the encouragement of thrift. This is accomplished by means of a scheme inaugurated about two years ago. Members authorise the company to deduct regular amounts from their salaries or wages, which are paid into a fund, together with any other amounts which the employés may care to put in. These savings earn interest at 5 per cent. calculated monthly, but paid at the end of the year. The fund is administered by trustees on savings bank lines, and the company has indemnified the trustees against loss. The funds are safely invested in trustee securities or fully-guaranteed loans to the company. The scheme has been so successful that at the present time there are over 4,000 members, and funds totalling £29,000.

Hertfordshire Agricultural Show.

The Hertfordshire Agricultural Show will take place this year at Hatfield Park on June 14th. The North Metropolitan Electric Power Supply Co. will occupy a stand at the show and will exhibit a considerable variety of electrical appliances suitable for use in connection with farms, farm-houses, and general domestic use.

A Lithuanian-Belgian Company.

A company is in course of formation in Brussels with a capital of 25,750,000 fr. (about £140,000) and the title La Société Belgo-Lithuanienne d'Electricité, to organise and finance electricity supply undertakings in Lithuania.

Social Events.

On May 12th a party of officials and employés from the Accrington Corporation Electricity Department visited Southport, on the invitation of the Southport Corporation Electricity Department Welfare Club. A bowling match was played on the municipal green adjoining the generating station, the Southport men winning by 38 points. Tea was served in the demonstration room of the Corporation showrooms. Mr. Moxon (borough electrical engineer), who was supported by Mr. W. T. Gann (deputy electrical engineer) and Mr. J. J. Young (works superintendent) welcomed the guests, and Messrs. C. Goward and Hall responded on behalf of the visitors and invited the Southport members to Accrington.

The staff of Siemens Lamp Works, Preston, held their first golf competition of the season on May 12th, on the links of the Dick, Kerr Club at Ashton Park. The competition, which took the form of medal play over 18 holes, was for the "Dr. Wright Prize," and the winners were Messrs. J. N. Aldington, K. G. Lockhead, and W. G. Creasy.

The Australian Domestic Appliance Market.

The American Assistant Trade Commissioner at Sydney reports that the development of the Australian demand for domestic electrical appliances has been accompanied by a great increase in competition, both among foreign suppliers and home manufacturers. American vacuum cleaners are said to be popular, although the competition of a Swedish make and cheap German machines is very keen. It is stated that there is no British or home-produced article offering serious competition. The local production of electric heaters has been very successful, aided by a 40 per cent. *ad valorem* duty. American washing machines are popular and there appears to be no serious British or Australian competition. Up to the present a well-known American make of electric iron has dominated the market. Local products at lower prices have not made much headway, and European competition is negligible. Dish-washers, toasters, and percolators are also said to be predominantly American.

A Permanent Exhibition in Berlin.

It is reported that the leading German manufacturers of machinery and electrical equipment have organised a "Haus der Technik" in a converted department store in Berlin. All kinds of apparatus are displayed in these premises, which will remain open as a permanent exhibition. The A.E.G. is the principal participant.

Illuminating Engineering.

We are pleased to learn that the seventeenth illumination design course conducted by the Lighting Service Bureau, London, was attended by some 70 engineers, representative of all sections of the electrical industry, and proved in every way a complete success. The lectures were more complete in data and presentation, and many additional devices were specially prepared for the demonstrations.

The French Small Motor Industry.

The Syndicate Général de la Construction Electrique has drawn the attention of the Minister of Commerce and Industry to the prejudicial situation created by recent Customs agreements for the branch engaged in the construction of small electric motors and domestic appliances, &c. It is stated that these branches have been entirely created since the war and now comprise over 25 works grouped in two syndicates under the auspices of the Syndicat Général; they have an annual turnover of about 75,000,000 fr., corresponding to an output of from 200,000 to 225,000 motors, or four times the number required for French consumption prior to the war, so that the exports are considerable. It is maintained that this particular industry deserves to be protected and the specific protection of from 25 to 30 per cent. which makers regarded as the minimum necessary for the existence of the industry was admitted in principle at the beginning of negotiations with Germany. Nevertheless, the duties were materially reduced on the signature of the provisional Franco-German agreement, and others were further reduced in the agreements with Switzerland and Italy.

Catalogues Wanted.

The THREE SPIRES ELECTRIC, LTD., 30, Union Street, Coventry, asks for factors' catalogues and lists.

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Iron Trades Employers' Insurance Association.

The report of this Association records a premium income of £597,006, to which are added interest, &c., £81,746, and a balance of £48,049 brought forward, making £726,801. Compensation and incidental expenses absorbed £469,654, and management expenses, &c., £56,312, leaving a balance of £200,835. Out of this it is proposed to return 15 per cent. of the Workmen's Compensation premium paid for 1927, together with a bonus of 12½ per cent., on which income-tax has already been paid. The report announces the resignations, owing to ill-health, of Messrs. A. E. Seaton (chairman) and A. Coventry (director).

Bankruptcy Proceedings.

E. WOOLLEY, E. KEABLE, and H. J. NASH, plumbers and electrical engineers, 3, Church Street, Bexhill.—First meeting held May 22nd, at the Official Receiver's offices, 12a, Marlborough Place, Brighton. Public examination, June 4th, at the Town Hall, Hastings.

H. H. SPEKE, electrician, 12 to 17, Bilston Street, Wolverhampton.—First meeting held May 23rd, at the Official Receiver's office, 30, Lichfield Street, Wolverhampton. Public examination, June 6th, at the County Court, Wolverhampton.

H. D. DOUGLAS (H. D. Douglas & Co.), engineer, contractor, wireless factor, &c., 32, Queen Victoria Street, E.C.4.—Last day for proofs for dividend, May 30th. Trustee, Mr. E. H. Hawkins, 4, Charterhouse Square, E.C.1.

W. T. SMITH, electrical and mechanical engineer, Victoria Street, and 60, Hampden Street, Bolton.—Last day for proofs for dividend, May 30th. Trustee, Mr. J. D. Turner, Official Receiver, Byron Street, Manchester.

G. C. LAZENBY, wireless engineer, 29, Old Town Street, Plymouth. Last day for proofs for dividend, May 29th. Trustee, Mr. P. S. Booth, Kimberley House, Holborn Viaduct, E.C.

S. J. SEWELL and W. L. BROWN (Sewell & Brown), electrical and radio engineers, 6a, The Exchange, Muswell Hill. Receiving order made May 16th, on debtors' own petition. First meeting May 30th. Public examination June 26th, at Carey Street, W.C.

P. FORD, electrical contractor, 4a, Macdonalds Lane, Corporation Street, Manchester. Application for discharge to be heard on June 25th, at the Court House, Manchester.

R. C. J. WARNER and S. R. PEARCY (Warner & Co.), electrical and radio engineers, 28, Hill Street, Poole.—Trustee, Mr. H. Ashton, Official Receiver, Midland Bank Chambers, High Street, Southampton, released May 11th.

F. LENG (F. Leng & Co.), electrical and mechanical engineer, 12, Godstone Road, Rotherham.—Trustee, Mr. L. J. Clegg, Official Receiver, 14, Figtree Lane, Sheffield, released May 11th.

H. A. MILLS, electrical engineer, &c., 1, Lorne Villas, Old Windsor.—Trustee, Mr. T. Gourlay, Official Receiver, 29, Russell Square, W.C., released May 3rd.

W. ROSS, wireless engineer, 35, Bridge Street, Haverfordwest.—Last day for proofs for dividend, June 1st. Trustee, Mr. H. W. Thomas, 4, Queen Street, Carmarthen.

H. BEBINGTON, electrical engineer, 14, Cestrian Street, Bolton.—Trustee, Mr. J. G. Gibson, Official Receiver, Byrom Street, Manchester, released May 7th.

E. F. WOODGATE, electrical engineer, 7, St. John's Terrace, and Brunswick Cottage, Weymouth.—Trustee, Mr. T. Barton, Official Receiver, City Chambers, Catherine Street, Salisbury, released May 9th.

J. A. M. JAMES (Fuchsiaphones Installations), wireless dealer, 11, Mill Street, Middleton, Lancs.—Trustee, Mr. F. Murgatroyd, Official Receiver, Byrom Street, Manchester, released May 7th.

J. G. SANDELL, electrical contractor, 20, Hart Road and Ansell Road, Dorking.—Trustee, Mr. T. Gourlay, Official Receiver, 29, Russell Square, W.C., released May 3rd.

Company Liquidations.

ERITH ELECTRICAL CO. (BARBER & WIGHT), LTD., electrical and wireless dealers, High Street, Erith.—The statutory meeting of creditors was held on May 16th, at the offices of Mr. L. G. Darling, 87-89, Aldgate High Street, E. The statement of affairs submitted showed ranking liabilities of £1,320, of which £1,297 was due to the trade. The net assets were £463. The company was registered in October, 1926, with a nominal capital of £400, and it acquired certain assets from Messrs. Barber & White, who had previously carried on business in partnership. The assets acquired were valued at £380, and that amount was discharged by the allotment to the vendors of 380 shares of £1 each; 12 shares were issued for cash. A first debenture for £100 was created in August, 1927, for cash advanced; in October last a further £300 was loaned to the company; and in January last a debenture for £300 was issued in respect of that loan. The chairman said he could find no entry in the minute book authorising the creation of that debenture, but he was advised that it was in order. The books were not completely written up at the date of his appointment. The bailiff had levied execution but had withdrawn. He (the chairman) was originally appointed as receiver and then as liquidator, and had closed the business down. The present position was attributed to expenses incurred in an endeavour to open up a new business on the South Coast, and bad debts. Mr. P. Houston proposed a resolution to the effect that the voluntary liquidation of the company should not be confirmed. He pointed out that such a resolution would leave the creditors at liberty to take any proceedings they liked, and he was of the opinion that compulsory liquidation should take place. The resolution was carried unanimously. The following are creditors:—

	£		£
Stearn Electric Co., Ltd.	439	Erith Electrical Contractors, Ltd.	32
Siemens Electric Lamps and Supplies, Ltd. ...	172	Truphonic Wireless Co.	26
British Thomson-Houston Co., Ltd.	83	Pope's Electric Lamp Co., Ltd.	23
General Cable Mfg. Co.	60	Grant & Stephens, Ltd.	23
Belling & Co.	58	General Accessories Co., Ltd.	22
Sturdy Eng. Co.	56		
Stella Lamp Co.	35		

WHITTAKER, HALL & CO., LTD., electrical engineers, Bolton.—A meeting of creditors was held on May 10th, at the offices of Messrs. Greenhalgh, Son & Dutton, 20, Acresfield, Bolton. Mr. Wm. Dutton, the liquidator, reported that the ranking liabilities totalled £3,506, of which £2,063 was due to unsecured creditors, and £1,443 to the bank, which was a partly secured creditor. The net assets were £3,759, leaving a surplus so far as the creditors were concerned of £253. The statement was prepared as at April 23rd last, at which date a receiver for the debenture holders was appointed. The company had been in existence for a number of years, and for some time past trading losses had been sustained. Debentures were issued in 1916 under a trust deed which expired in ten years, and in 1926 they were re-issued. Debentures to the extent of £3,000 were held by the directors, as consideration for their guarantee of the bank overdraft. The balance was in respect of cash advanced. An advisory committee of two of the principal creditors was appointed to deal with the matter.

J. BRENT & CO., LTD., 71, Queen's Road, Watford.—The winding-up order herein was made in the early part of this year. The creditors met in March last at 29, Russell Square, London, W.C.1, when the liabilities were put down at £1,180, against assets of £35. The following are creditors:—

	£		£
Allen, F. C.	907	Smith, J. & W. B., Ltd.	74
Berry's Electric, Ltd. ...	24	Times Electric Co. ...	26
Falk, Stadelmann & Co., Ltd.	26	Wenham Lighting Corporation, Ltd.	28
Russell, J. W.	49		

YORKSHIRE ELECTRIC WIRING & MOTOR CO., LTD.—Winding up voluntarily. Liquidator, Mr. W. Neal, c/o Messrs. Phillips and Co., 39, Bank Street, Sheffield. A meeting of creditors is called for May 25th, at the Law Society's Rooms, Bank Street, Sheffield. Particulars of claims to the liquidator by June 25th.

Dissolutions of Partnership.

BRITISH WIRELESS SERVICES, wireless engineers, 3, Queen's Square, Leeds.—Mr. C. S. Charter, Mr. J. Woodhead, and Mr. A. E. Clarke have dissolved partnership. Messrs. Charter and Woodhead will attend to debts.

BAKER & HYMAN, electrical manufacturers, general engineers, &c., 11, 13 and 13a, Portland Crescent, Leeds.—Messrs. H. and L. Hyman have dissolved partnership. Mr. L. Hyman will attend to debts and continue the business under the same style.

Trade Announcements.

Messrs. G. A. HOWARD, electrical engineers, 24, Silver Street, Lincoln, have opened a recently-completed extension to their premises.

Mr. W. H. CASS, electrical dealer and contractor, of 95, Park Lane, Leeds, asks for catalogues and lists, &c.

We are informed that Mr. H. E. ANGOLD, late voltage regulator specialist to the Metropolitan-Vickers Electrical Co., Ltd., has joined Messrs. Smith Meters, Ltd., of 186, Kennington Park Road, London, S.E.11, where he is starting an electrical department and will shortly be placing on the market a new a.c. house service meter which he has designed, and for which patents have been applied for. The meters will be manufactured at the company's works in London.

Messrs. NUTTER, SON & EDGE, LTD., who have lately taken over the business of P. Nutter & Son, Newcastle-on-Tyne, state that the registered office of the company is at Cromford House, Cromford Court, Manchester. The North-East Coast sales office is at 90, Pilgrim Street, Newcastle-on-Tyne. The offices of the "COQ" SWITCHGEAR CO. have been removed to the same address in Manchester.

Messrs. W. B. TREW & SON, makers of h.f. apparatus, have removed from Kingsbury Works to larger premises at Hillside Works, Kingsbury Road, Hendon, N.W.9.

The Marking of Imported Bearings.

The Standing Committee under the Merchandise Marks Act, 1926, is to consider on June 4th (and, if necessary, June 5th) an application for an Order requiring the marking with the country of origin of imported ball and roller bearings and parts.

New Catalogues and Lists.

MESSRS. JAMES MCMILLAN & CO., Clun House, Surrey Street, Strand, W.C.2.—A priced and illustrated leaflet advertising an electric soldering iron.

THE BRITISH THOMSON-HOUSTON CO., LTD., Rugby.—Descriptive List No. 5,030, containing a great deal of information regarding electric control gear for mines and quarries. Fully illustrated.

THE ENGLISH ELECTRIC CO., LTD., Queen's House, Kingsway, W.C.2.—Publication No. 917, giving a brief description of "English Electric" dual-frequency motors (25 and 50 cycles). Illustrated.

MESSRS. J. H. TAYLOR & CO., Macaulay Street, Huddersfield.—A very comprehensive price list (T99) of all makes of radio apparatus, with a supplement devoted to wiring materials and accessories, &c.

VENNER TIME SWITCHES, LTD., 45, Horseferry Road, S.W.1.—Lists Nos. 45 and 46, dealing respectively with time switches for late shop-window lighting, and "Venner" thermostats (6,- 10-, and 15-A). Illustrated and priced.

MESSRS. A. REYROLLE & CO., LTD., Hebburn-on-Tyne.—Publication No. 742/3-28, containing a detailed description of the company's split-pilot feeder-protective gear (a self-balancing Merz-Price system).

THE ROTARY AIR COMPRESSOR CO., LTD., 12, Victoria Street, S.W.1.—An illustrated pamphlet dealing with the "R.A.C." automatic water alarm. Priced.

ELECTRIC FIRES, LTD., King Street, Norwich.—Catalogue Section G, describing, with illustrations, "Heatrae" apparatus for heating large quantities of oil in circulation. Priced.

MESSRS. MARELLI & CO., LTD., 19 & 20, Garlick Hill, Queen Victoria Street, E.C.4.—A series of illustrated and priced publications, giving details of the company's fans of all patterns.

Z ELECTRIC LAMP & SUPPLIES CO., LTD., 73, Newman Street, Oxford Street, W.1.—Price List No. 428, a catalogue of wires and cables, and wiring materials and accessories.

MESSRS. D. H. BONNELLA & SON, LTD., 46 & 48, Osnaburgh Street, N.W.1.—Catalogue Section M, containing illustrations and prices of commercial motor accessories, including lighting fittings.

MESSRS. GENT & CO., LTD., Faraday Works, Leicester.—Book 7, Section 6, describing "Pul-syn-etic" idle-machine and output recorders, illustrated.

THE SUN ELECTRICAL CO., LTD., 118 and 120, Charing Cross Road, W.C.2.—A leaflet announcing revised prices of "Sunco" electric fans for use with General Catalogue No. 458.

MR. C. R. GARRARD, 11, Duke Street, London Bridge, S.E.1.—An illustrated pamphlet describing a patent infinitely variable and positive transmission gear.

THE HOTPOINT ELECTRIC APPLIANCE CO., LTD., 24, Newman Street, Oxford Street, W.1.—An illustrated booklet describing the combined draining board, sink and dish-washer which was shown in the "House of the Future" at this year's Ideal Home Exhibition.

THE MACINTOSH CABLE CO., LTD., St. James's House, St. James's Street, S.W.1.—An illustrated net trade price list of "Maconite"-insulated wires, cables and flexibles.

HOUGHTON-BUTCHER (GREAT BRITAIN), LTD., 88-89, High Holborn, W.C.1.—"Houghton's Radio News" for May, containing particulars and prices of radio apparatus.

THE MULLARD WIRELESS SERVICE CO., LTD., Nightingale Lane, Balham, S.W.12.—Two illustrated leaflets describing silica transmitting valves.

MESSRS. J. & H. MCLAREN, LTD., Midland Engine Works, Leeds.—Catalogues Nos. 58 and 60, illustrating and describing "McLaren-Benz" Diesel oil engines.

KORTING & MATHIESEN ELECTRICAL, LTD., 711 and 715, Fulham Road, S.W.6.—List No. 8166, containing illustrated particulars and prices of "Kandem" single-phase electricity meters, and List No. 1,528, dealing with "Winlux" shop-window reflectors.

MESSRS. W. B. TREW & SON, Kingsbury Road, Hendon, N.W.9.—An illustrated price list of "Tru-Ray" high-frequency apparatus.

BROOK MOTORS, LTD., Empress Works, Huddersfield.—A postcard advertising the company's motors.

THE YORKSHIRE ELECTRIC TRANSFORMER CO., LTD., Dewsbury.—A series of leaflets illustrating examples of the company's transformers and kiosks for various applications.

Recent Contracts.

Among the more important contracts secured by the Underfeed Stoker Co., Ltd., this year are the following:—Class "L" stokers—Corporations of Hull, Bury, Hastings, Brighton, Barrow-in-Furness, Watford and Carlisle, Finchley U.D.C., Shropshire, &c., Electric Power Co., Northampton Electric Light & Power Co., Ltd., and Scottish Central Electric Power Co. Air heaters—London Power Co., Ltd. Ash-handling plant—Birmingham Corporation (Hams Hall) and London Electric Railway Co. (Lots Road).

Unemployment.

The Employment Exchange registers for the week ended May 7th recorded a decrease of 32,200 in the number of unemployed. The total was 1,103,800, as compared with 1,136,000 on April 30th, and 998,291 on May 9th, 1927.

Employment During April.

The May *Ministry of Labour Gazette*, reviewing the labour position during April, says that employment in the engineering industry was still quiet and showed a slight decline on the whole as compared with the previous month; it remained fairly good in the electrical branch. The monthly analysis shows that the proportion of unemployed in the engineering industry rose from 8.4 to 8.6 per cent., while in the electrical branch it remained stationary at 4.7 per cent. There was an improvement in the electrical wiring and contracting industry, the proportion of unemployed falling from 7.3 to 6.5 per cent. There was a slight rise in the figure for the electric cable, wire and lamp manufacturing group—from 6.0 to 6.2 per cent. The actual numbers of unemployed were as follows on April 23rd:—Engineering, 83,370; electrical engineering, 3,666; electrical wiring and contracting, 937; and electric cable, wire, and lamp manufacture, 5,211.

Modern Cable Transport.

In the development of road transport many heavy electrical manufactures are leaving the railways. An example of a special vehicle for the carriage of heavy cables by road is illustrated in the accompanying picture. This is sufficiently self-explanatory to need no further comment, although attention may be drawn to the four rear wheels and to the fact that the vehicle is a "Scammell" production.

A New "J. & P." Cable Lorry.

The Fan Season.

An indication that "Sumer is i-cumen in" is the appearance in our advertisement pages of several announcements by fan manufacturers, together with a number of catalogues and lists received from them. The General Electric Co., Ltd., announces another fan "campaign" with an offer of various forms of "ammunition" for dealers, such as pamphlets for over-printing, window and counter display material, &c. Messrs. L. G. Hawkins & Co., Ltd., are also making special arrangements in respect of their fans. Other companies whose lists have been received are Siemens Electric Lamps & Supplies, Ltd., the Sun Electrical Co., Ltd., and Marelli & Co., Ltd.

The Export Credits Insurance Scheme.

The Government proposes to set up a committee to inquire into the working of the Export Credits Insurance scheme of the Department of Overseas Trade with a view to recommending whether the business should be continued by the Department or handed over to private enterprise.

Greatly Exaggerated.

A more or less sensational mid-day Press report appeared one day last week regarding what was described as a "Fire Thrill" at the "Tricity" Restaurant in the Strand, but we learn from the proprietors, Tricity Restaurants, Ltd., that the affair was so slight that many of the staff knew nothing about it, and the dancers were quite unperturbed. "Business is not only as usual, but more so!"

Jugo-Slav Import Duty Reductions.

The Serb-Croat-Slovene Customs authorities announce the following reductions in import duties as from May 3rd:—"Electrical apparatus for measuring electric current," from 150 to 50 dinars per 100 kg.; "cables for the subterranean or submarine transmission of electric current," from 50 to 10 dinars per 100 kg. The *Board of Trade Journal* states that the application of the reduced duties is made subject to conditions laid down by the Ministry of Finance, and the duties will remain in force so long as the articles in question are not made in the Serb-Croat-Slovene Kingdom.

Barcelona's Cable Imports.

In a report upon the industries and trade of Barcelona (reproduced in the *Board of Trade Journal*), the British Vice-Consul says that the market for electric cables has shown considerable improvement, and the United Kingdom has recovered its lost position. The total imports in 1926 amounted to 875 tons, of which the United Kingdom supplied 682 tons and Germany 36 tons. In 1925 this country supplied only 14 tons out of a total of 309, while Germany provided 265 tons.

Book Notices.

"The British and Dominions Trades Directory." (754 pp.) London: The Association of Dominion and British Trades, Ltd. Price 30s. net.—This is the first edition of a directory which gives particulars of over 35,000 overseas firms dealing in all classes of goods, together with a list of merchants, manufacturers and shippers in Great Britain and Ireland. The overseas division is arranged in commodity sections, in each of which the firms are placed alphabetically. In general, the details given comprise the name and address, with an indication of the firm's principal interests. The British division is in two parts—one alphabetical and the other classified under commodity and trade headings. The overseas division devotes over ten three-column pages to various sections of the electrical industry, apart from references appearing elsewhere. The electrical section of the classified British list is comprehensive, although we notice several important omissions, as well as occasional superfluities. For instance, although the aim of the publishers is the encouragement of trade within the Empire, only one name appears in the "Electric suction cleaners" section, and that Transatlantic; under "Vacuum cleaners" the same company and another not all-British concern appear. Some of the leading electric lamp manufacturers are missing from their particular section—but the same criticism may be offered of other sections. While we appreciate the difficulty of covering every industry thoroughly, we think that more careful selection should be exercised in future editions. The volume concludes with a trade-mark section and a list of actual buyers of specified commodities.

"Coloured Thinking." By D. F. Fraser-Harris, M.D., D.Sc. Pp. vii+269. London: George Routledge & Sons, Ltd. Price 5s. net.—This is a collection of essays on scientific subjects, many of which have appeared in periodicals; they are written in non-technical language with the laudable intention, we gather, of edifying those who desire to extend their knowledge but are unable to follow scientific "jargon." For that purpose the essays are eminently suitable, though they happen to have little bearing upon electrical matters. "The Sixth Sense, and other Studies in Modern Science" is a similar book by the same author and issued by the same publishers, price 5s. net.

"Applied Elasticity." By S. Timoshenko and J. M. Lessells, B.Sc. First Edition. Pp. xxi+544; figs. 391. London: Constable & Co. Ltd. Price 25s. net.—This book is arranged in two parts: The first deals with the analysis of stresses, and contains some advanced chapters devoted to the theory of strength of materials, and should prove useful to the designer in mechanical engineering. Part 2 is a work on the experimental side of the subject, and contains some chapters on the mechanical properties of materials, principally metals, used in modern construction.

The "Summer" number of *Punch* (1s.) has reached us well in advance of the summer itself, but as usual it affords a good half-hour's brightness while we are waiting for the sun to shine. It contains more colour pages and more literary work than in previous years.

"*Journal* of the Institution of Electrical Engineers." Vol. LXVI. May, 1928. London: E. & F. N. Spon, Ltd. Price 10s. 6d.

"*Journal* of the American Institute of Electrical Engineers." Vol. XLVII. May, 1928. New York: The Institute. Price $1.

Fire.

A fire broke out in the rear of the Farringdon Road premises of Messrs. Falk, Stadelmann & Co., Ltd., on Wednesday last. It was confined to the packing floors, and the business was not affected.

Whitsuntide Holidays.

The offices of the JACKSON ELECTRIC STOVE CO., LTD., will be closed on Monday and Tuesday next, the 28th and 29th, for the Whitsun holidays.

Switchgear for the Central Scotland Scheme.

Further important contracts have been placed by the Central Electricity Board in connection with the Central Scotland Section of the "grid." The new orders cover the switchgear required for the main sub-stations in this section, and are divided between the Metropolitan-Vickers Electrical Co., Ltd. (£182,000) and the British Thomson-Houston Co., Ltd. (£134,000). The individual contracts now placed with these companies are said to be larger than any switchgear contracts ever before placed with British manufacturers. The Metro-Vick contract covers the switchgear for the seven main sub-stations of the western portion of the system, *viz.*, Glasgow (Dalmarnock), Yoker, Port Dundas, Clydes Mill, Greenock, Kilmarnock and Paisley. The B.T.-H. contract covers the switchgear for the six main sub-stations of the eastern portion, *viz.*, Edinburgh (Portobello), Dunfermline, Bonnybridge, Motherwell, Kirkcaldy and Dundee. The apparatus in each case is for controlling the power, which is to be transmitted at a pressure of 132,000 V, from the generating stations to the sub-stations. Contracts for the sub-station transformer equipment were recently placed with the Metropolitan-Vickers Co., Ferranti, Ltd., and the English Electric Co., Ltd. All the sub-stations are to be of the outdoor type, both the transformers and the switchgear being arranged for outdoor operation. The principal units of the switchgear are oil-immersed circuit-breakers, totalling about 45 in all, each circuit-breaker consisting of three units in separate tanks. Each unit will stand over 8 ft. in height to the top of the tank, and about 15 ft. to the top of the terminals. Each three-phase group complete with oil will weigh about 25 tons. The Board has placed the contract for the special river crossings of the Cart and Clyde and Forth (£33,000) with the Foundation Co., Ltd.

Zinc Production in Tunis.

Although large quantities of zinc ore are mined in Tunis, 29,000 tons having been produced in 1926, it has hitherto always been shipped to France and other countries for treatment. A company, known as the Société des Exploitations Minières en Tunisie, has, however, decided to establish a plant near Toureuf for the electrolytic treatment of zinc ore obtained from the Tunisian mines.

The Brazilian Market.

The Department of Overseas Trade has received a report on conditions in the State of Pará, Brazil, by the British Consul at Pará. In this the necessity for a closer study of the market by British traders is again urged. There is said to be a lack of propaganda for British goods; commercial travellers are rarely seen, and when they do visit the State they are inadequately provided with samples as compared with their German rivals. More frequent visits by commercial travellers with a knowledge of Portuguese would be well repaid in view of the goodwill still enjoyed by articles of British manufacture.

Removal of Petters' Ipswich Business.

The Ipswich business taken over by Messrs. Petters, Ltd., from Messrs. Vickers, Ltd., some time ago is to be closed. It is stated that the efficiency of the company is impaired by reason of its having two widely-separated works, and it is intended to concentrate production in the Yeovil works in future.

The Timber Market.

Our Timber Trade Correspondent reports that the spot market for soft building and general utility woods has kept very steady to firm during the past month, but prices on the spot are not sufficiently high yet to meet the equivalents of European shippers' f.o.b. and c.i.f. values, and this position is acting against future business, which it appears at present will have the effect of leaving large supplies unsold in European exporters' hands. The latter, however, are remaining firm, as they state that their rates are necessary on account of the higher prices of logs this year, and increased on-costs in other departments. Finnish manufacturers have already decided to cut less wood this season to bring the manufacture into line with the United Kingdom and Continental demand. The more common hardwoods are still arriving freely with rates unsteady and demand moderate. The better class woods are in small supply at very firm rates; East Indies teak, as well as satinwood and ebony, are highly valued, and good quality mahogany also is commanding fair rates.

Prices of Raw Materials.

Messrs. James Forster & Co., reporting on May 19th, stated that the same conditions prevailed during the week as during the previous two weeks, the market being dull and uninteresting and mainly professional. Consumption was no better and arrivals were adequate but not excessive, and that state of affairs seemed likely to continue, as there was nothing in sight to upset the existing even balance of supply and demand.

Messrs. F. Smith & Co. report, May 22nd:—Copper (electrolytic) bars) £68 5s., 20s. inc.; ditto ditto sheets, no change; ditto ditto wire rods, £78 5s., 20s. inc.; ditto ditto h.c. wire, £9 11/16d., ¼d. inc.

Messrs. James & Shakespeare report, May 22nd:—No change in the prices of copper bars, sheet and rod and English pig lead.

Messrs. Edward Till & Co. report, May 22nd:—No change in the price of india-rubber, Para fine.

For Sale.

Yorkshire Electric Power Co. invites offers for surplus plant. Mr. H. J. Shaw will sell by auction on June 7th, at 13, High Holborn, a quantity of electrical and wireless goods, &c. (See our advertisement pages to-day.)

The British Industries Fair.

We have received from the general manager of the Birmingham section of the British Industries Fair a copy of the prospectus of next year's Fair, which is to be held from February 18th to March 1st. A notable feature of this is the inclusion of a view of the Castle Bromwich buildings, with a statement that they represent 400,000 sq. ft. under one continuous roof. The Council again includes a number of gentlemen connected with the Midlands electrical industry, among them being Mr. J. Belliss (Belliss & Morcom, Ltd.), Mr. F. Forrest, M.I.E.E., Dr. C. C. Garrard (General Electric Co., Ltd.), and Mr. T. R. Martin (J. H. Tucker & Co., Ltd.). It is noted that the Government has again agreed to spend a sum not exceeding £25,000 for the purpose of publicity for both sections of the Fair at home and abroad. The arrangement of the exhibits follows the lines adopted last year, with a special electrical section covering generation, transmission, and applications. The prospectus includes a form of application for space.

Lighting and Power Notes.

Airdrie.—APPOINTMENT OF CONSULTING ENGINEERS.—We are informed that Messrs. Stevenson & McGuffie have been appointed consulting engineers to the Airdrie and Coatbridge Town Councils.

Ammanford.—SUPPLY TO G.W.R.—The Urban District Council has received a request from the G.W.R. Co. for a quotation for the supply of 12,500 kWh per annum to the company's engine sheds at Pantyffynnon. The Council agreed to reply that if the company could see its way to use electricity at all its railways stations in the area, a flat rate of 4½d. per kWh would be offered, subject to a minimum consumption of 10,000 kWh per annum.

The Electricity Committee has recommended the following new scale for lighting:—First 500 kWh per quarter, 9d. per kWh; next 500 kWh, 8d.; over 1,000 kWh, 6d.

Bedford.—LOANS SANCTIONED.—The Corporation Electricity Committee has obtained sanction for loans of £8,000 for buildings and £68,000 for plant in connection with the extension of the generating station.

Birmingham.—PROGRESS AT HAMS HALL.—Members of the Corporation Electric Supply Committee recently paid their first official visit to the site of the new super-power station, which is being erected at Hams Hall. Practically all the foundations have been laid for the various buildings and for the first of two cooling towers. Each tower will be capable of cooling the circulating water necessary for a 30,000-kW set. Upon completion, each tower will be 220 ft. high and 168 ft. in diameter at the base. About 600 tons of the steel construction has been erected.

Blackpool.—YEAR'S WORKING.—Mr. C. Furness (borough electrical engineer), has issued his annual report, which records an increase in sales amounting to over 6,000,000 kWh. The total output was 33,636,000 kWh. Nearly 2,000 new consumers were connected, bringing the total to 15,002. The net profit was £32,000.

Blackrod (Lancs.).—ELECTRICITY SUPPLY.—The Urban District Council has consented to the granting of an Order to the Lancashire Electric Power Co., authorising it to supply electricity within the district.

Canada. — HYDRO-ELECTRIC DEVELOPMENT. — The first 220,000-V step-down transformer station in Canada is now being erected by the Hydro-Electric Power Commission of Ontario at Leaside, a suburb of Toronto. This is the receiving end for power being transmitted over 200 miles from the Gatineau power project at Paugan Falls, on the Gatineau River, north of Ottawa in the Province of Quebec. The transmission line has been under construction since last autumn. The new transformer station when completed will be one of the largest single stations on the Continent. The site covers 12 acres and the battery of transformers will be of the largest practicable size. The first portion of the station is to be ready to receive power by October next.

Announcement has been made at Ottawa that the Calgary Power Company has been given a lease of the water power site on the Bow River at its junction with the Ghost River. Application for this site was in the nature of an alternative to the development of Spray Lakes power, which is left in abeyance. It is stated that the additional power secured at the Ghost site will be sufficient for the requirements of the Calgary Power Company during the next five years.

The Provincial Government was to offer by public auction on May 23rd the leasehold rights to water-power controlled by it on the Saint Maurice River with potential energy of between 100,000 and 150,000 h.p. The successful bidders were to agree to carry out developments to the extent of $25,000,000.—*Reuter* (Quebec).

Continental.—BELGIUM.—The report of the Société d'Electricité du Borinage shows that during 1927, the number of consumers increased from 27,899 to 31,339, and the load on the station from 23,783 to 26,303 kW. During the year 34½ miles of new mains were laid, bringing the total up to 747 miles.

The 1927 report of the Société d'Electricité du Nord de la Belgique shows that the company is now supplying electricity to 119 localities with a total population of 561,643 inhabitants. The number of customers increased from 61,572 to 76,970, and the load from 71,646 to 79,436 kW. During the year 187½ miles of new mains were laid, bringing the total up to 1,465 miles.

The report of the Société Electrique de l'Entre Sambre et Meuse for last year shows that the company is now supplying 31,781 consumers, an increase of 2,500 during the twelve months. The sales advanced from 46,467,650 to 50,354,438 kWh. Twelve additional villages were connected up to the distribution system during the year, and by the end of 1928 it is expected that supplies will be available in the whole province of Namur.

SWEDEN.—Under the auspices of the various Swedish Electrical Associations, a new body has been organised in Stockholm (13 Tulegatan) to be known as "the Swedish Association for the Rational Use of Electricity." The intention of the new organisation is to promote the more extended and better use of electricity for all purposes, to educate the public with regard thereto, and to explain the simple precautions to be taken to prevent accidents. In furtherance of the idea the new body intends to issue a monthly journal.

Croydon.—LOAN.—The Corporation Electricity Committee is to apply for sanction to a loan of £50,000 for mains extensions.

Darwen.—ELECTRICAL DEVELOPMENT.—Reviewing the progress of the electricity undertaking, Alderman J. B. Thornley, at the May meeting of the Town Council, said that new generating and converting plant would be required to meet the winter demand. The cost of this would be met from revenue. The year's profit from electricity amounted to £6,860, the electrical energy sold amounted to nearly 5,000,000 kWh, and new consumers connected totalled 560.

Dumfries-shire.—ELECTRICITY SUPPLY.—The County Council has adopted a scheme, submitted by Messrs. Merz & McLellan, to provide an electricity supply for the whole of the county, excluding Dumfries which, with Maxwelltown, is covered already by a Provisional Order. The estimated capital outlay is £85,724.

East Ham.—LOAN SANCTIONED.—The Corporation Electricity Committee has obtained sanction to borrow £8,943 for mains extensions.

Exeter.—INAUGURATION OF EXTENSIONS.—Extensions at the Corporation electricity works, which were formally opened on May 16th by the Mayoress, include one 5,000-h.p. steam turbine running at 3,000 r.p.m. The auxiliary pumps for the condenser are driven by a small turbine of about 70 h.p. and still smaller steam turbines drive the boiler feed pumps. The new water-tube boilers supplying steam for the plant can generate 45,000 lb. of steam per hour. With the new plant provision has been made for changing the frequency of supply to the standard 50 cycles, and while the alteration is in progress a rotary frequency changer is in use to connect the two systems of supply. The tramway supply is given by convertors operating upon either system, to provide the direct current required, with a steam-driven generator in reserve. A further extension, with a turbine and boilers of similar capacity, on the space at present occupied by the oldest engines and boilers, is now to be made, and an e.h.p. supply is to be provided, which can be used for the city or for outlying areas as may be required. When this is completed the capacity of the station will be nearly 12,000 kW. The extensions have been carried out under the supervision of the city electrical engineer (Mr. H. D. Munro).

The City Council has authorised the Electricity Committee to apply for sanction to a loan of £12,000 for certain machinery required in connection with extensions to the power station.

Lincolnshire.—OPPOSITION TO ORDER.—At a quarterly meeting of the Kesteven County Council, held at Sleaford, a report of the General Purposes Committee was adopted recommending that formal objection should be lodged to the Lincolnshire Electricity Order, promoted by Mr. R. Borlase Matthews, so that special investigation might be made at the inquiry as to the ability of the promoter to carry out the technical and financial parts of the scheme to the best advantage of the county.

Liverpool.—NEW POWER STATION.—At a meeting of the Tramways and Electric Lighting Committee on May 18th, a report submitted by the city electrical engineer recommending that steps should be taken for the purchase of a site on the River Mersey and that a new power station be erected, was adopted. The station will be one of the principal stations in the Lancashire area, and will play an important part in the scheme for North-West England, now being completed by the Electricity Commissioners. The site is at the Clarence Dock, and it will be purchased from the Mersey Docks and Harbour Board. In accordance with the wishes of the Electricity Commissioners, the station will contain in the first instance two alternators, each of 50,000 kW with the necessary boilers, but the ultimate capacity will be eight sets with a total of 400,000 kW. The first stage of the scheme will cost £1,600,000, and the interest and sinking fund charges will be guaranteed by the Central Electricity Board. This station will not only supply Liverpool, but will be linked up with other large stations, so that it will be one of the main stations for the supply of the area, including the whole of Lancashire and most of Cheshire and West Yorkshire. The erection of the station will take the place of the extensions of Lister Drive station approved by the City Council in December, 1927. All the electricity generated will be purchased by the Central Electricity Board.

London.—LEWISHAM.—The Borough Council has accepted the offer of the South Metropolitan Electric Light and Power Co., Ltd., for the lighting of the third section of the Grove Park Housing Estate.

FULHAM.—The Borough Council Electricity Committee has decided upon the following schemes:—Extension of h.p. cable from Barclay Road sub-station to Otto House sub-station, £2,161; additional l.p. cable in Farm Lane, £731; l.p. cable in the Broadway district, £853; l.p. cable in Fulham Palace Road, £900; mains for the purpose of supply to Messrs. Evan Osgood & Co.'s premises, Albert Wharf, £621.

ST. MARYLEBONE.—The Electricity Committee states that with regard to the borough electrical engineer's reports upon plant extensions and further bulk supplies, which were submitted to the Electricity Commissioners in February, 1927, with the intimation that the Council might be disposed to proceed

with the necessary applications for approval to extensions of plant as indicated, the Commissioners have replied stating that, having regard to changes which have occurred since the engineer's reports were prepared, they are of opinion that the possibility of a bulk supply should be reconsidered; and asking if the Council would furnish them with a detailed estimate of the cost of extensions of the power station by the installation of, say, one 20/25,000-kW set with boilers, &c., as compared with the cost of an additional bulk supply. The Committee has appointed a sub-committee to report upon the possible extension of the power station, and as to the additional accommodation which will be required.

The Finance Committee reports the receipt of sanction to the borrowing of £32,000 for mains and services, and £8,000 for plant (consumers' sub-station equipment).

BERMONDSEY.—In connection with the Borough Council's application for sanction to borrow £54,000 for the erection and equipment of a new station, the Electricity Commissioners state that they will not be in a position to issue their formal sanction in the matter until the receipt of further particulars. As, however, they are satisfied generally with the proposals, they would raise no objection if the Council proceeded to put the works in hand in anticipation of loan sanction. The Electricity Committee has reported with regard to certain items of the new machinery, that it would be more economical for the London Electric Supply Corporation to obtain tenders for the plant required by it to give the Council a full bulk supply, and for the Council to pay the contractors the proportion chargeable. The borough electrical engineer is obtaining tenders for the remaining machinery, and the general manager of works is to proceed with the preparation of the necessary plans and drawings, which will be submitted to the Commissioners.

Portland.—ELECTRICITY SUPPLY.—At a meeting of the Special Electricity Committee of the Urban District Council, Mr. Seabrook and Mr. Uttley attended and stated that objections had been made to the proposed overhead cable along the beach and pointed out certain difficulties to be encountered if the cable were laid across the quarries between Yeates Road and Reforne. They therefore suggested an underground cable. The extra cost was estimated at £3,200. Mr. Seabrook was instructed to obtain alternative tenders for overhead and underground cables in the various sections.

Preston.—LOAN SANCTIONED.—The Corporation Electricity Committee has received sanction to borrow £38,427 for boiler-house plant.

MAINS EXTENSIONS.—The mains on Collon House Estate are to be extended at a cost of £8,080.

Price Reductions.—Reductions in the charges for electricity have been made or recommended in the following districts:—

NELSON.—Lighting: Ordinary consumers, a reduction of ½d. per kWh; prepayment meters, a reduction of 1d.

BRIERFIELD.—Lighting: A reduction of ½d. per kWh.

WEST HAM.—Lighting: Ordinary meters, varying from 3½d. per kWh for the first 3,500 kWh to 2½d. per kWh for all over 20,000 kWh; prepayment meters, 4½d. per kWh. Power: First 40 kWh per h.p. installed per quarter, 3d. per kWh; all electricity in excess of this amount, ½d. per kWh. Heating and cooking: 1d. per kWh. Factory lighting: Up to 10 per cent. of quarterly power consumption or 15 per cent. of monthly power consumption, 2½d. per kWh. Theatres, &c.: 3d. to 2½d. per kWh, less discount for prompt payment according to scale. Domestic tariff: An annual charge per 60-watt lamp, varying according to the number of lamps installed, plus ½d. per kWh.

WINDSOR.—*The Windsor Electrical Installation Co., Ltd.*—Lighting: Flat rate from 8½d. to 7d. per kWh.

SLOUGH AND DATCHET.—*Slough and Datchet Electric Supply Co., Ltd.*—Lighting: Flat rate from 8½d. to 7d. per kWh.

Sheffield. — ELECTRICITY EXTENSIONS. — The Corporation Electric Supply Committee has approved the installation of a 25,000-kW generating set, following receipt of permission from the Electricity Commissioners to erect two sets of this capacity. Building extensions will be begun immediately, and the estimated cost of the improvements is approximately £500,000.

Spalding.—LOAN SANCTIONED.—Sanction has been received by the Urban District Council to the borrowing of £5,000 for mains and services.

Special Orders.—The Electricity Commissioners have submitted to the Minister of Transport for confirmation Special Orders made by them authorising Clitheroe Corporation to supply electricity in part of the rural district of Bowland; the Tisbury Electric Supply Co., Ltd., to supply in part of the rural district of Tisbury; and the Salisbury Electric Light and Supply Co., Ltd., to supply electricity in parts of the city of New Sarum and of the rural district of Salisbury.

Renfrew.—PROPOSED DESTRUCTOR WORKS.—The Town Council proposes to install a refuse destructor, and a deputation has visited Horsham (Sussex) where plant erected in 1914 to generate electricity is in use.

Weybridge.—PURCHASE SCHEME REJECTED.—It was reported at a recent meeting of the Urban District Council that the Council's offer to purchase the local undertaking of the Urban Electric Supply Co., Ltd., had been rejected.

Tramway and Railway Notes.

Australia. — BRISBANE (QUEENSLAND). — We have received from Mr. G. R. Steer, general manager of the city tramway undertaking, a copy of his report, together with the statement of accounts for the year ended December 31st last. The total revenue amounted to £814,312, and working expenses were £613,285, leaving a gross profit of £201,027. The figures for the preceding year were: Income, £767,708; working expenses, £588,262; gross profit, £179,446. After providing for depreciation, amortisation and sinking fund, there was a net surplus of £17,313, as compared with a loss of £2,117 in the previous year. The capital expenditure during the year amounted to £143,761, the bulk of which was expended on the construction of new track and cars. The number of car-miles run increased from 6,301,126 to 6,535,833, but the number of passengers carried fell from 81,802,945 to 78,057,620, due to the increase in the minimum fare, temporary trade depression, &c. The revenue per car-mile rose from 28.10d. to 29.02d.

Bournemouth.—YEAR'S WORKING.—In his annual report, Mr. I. Bulfin, the Corporation tramway manager, states that the net surplus from the tramway amounts to £11,485, and the net surplus from the "tram-o-car" and runabouts is £2,153, making a total surplus for the whole of the undertaking of £13,638, from which must be deducted the contribution to the rates of £4,368 and a deficit from last year of £856, leaving a balance of £8,414. He has recommended that of this sum £7,000 should be placed to reserve, and the remainder to the renewals fund.

Bradford.—SCHEMES ABANDONED.—The principal tramway works proposed by the Corporation Bill in the borough of Brighouse and the urban district of Hipperholme have been abandoned owing to the lack of agreement on the subject with the Halifax Corporation.

Canada.—TUNNEL SCHEME FOR MONTREAL.—Negotiations are proceeding for the construction of a tunnel under the Lachine canal to link up the outlying municipalities of Verdun, Lasalle and St. Gabriel with Montreal proper. The proposed tunnel will consist of four tubes, two for tramways and two for vehicular traffic, the cost ($2,500,000) to be equally divided between the Federal Government, the City of Montreal, and the Montreal Tramway Co.—*Reuter* (Montreal).

Continental.—SWITZERLAND.—The electrification work having been completed, an electric-train service has commenced on the sections of the Swiss Federal Railways between Zollikofen and Biel, Sargans and Chur, Lengnau and Delsburg, and between Winterthur, Romanshorn and Rorschach.

BALEARIC ISLES.—Work is in hand on the electrification of the railway between Palma and the Port of Soller in Majorca, one of the Balearic Isles. The line between the two places, which is nearly 17 miles in length, will be operated with d.c. at 1,200 V, and there will be about two miles of line in the Port of Soller operated at 600 V. The contract for the overhead lines and the equipment of one of the transformer stations has been secured by the Siemens-Schuckert Co., of Berlin. The sub-station plant will comprise two 125-kW transformers.

GERMANY.—*Commerce Reports* states that the German Railway Co. (Deutsche Reichsbahn Gesellschaft) has recently put into operation an electric express-train service between Leipzig and Halle and Leipzig and Magdeburg, a distance of 37.6 km. and 123.7 km, respectively. An electrically-driven passenger car at the forward end of these trains provides the motive power, similar to the propulsion principle of the ordinary municipal subway trains. Formerly this method of electrical working had only been adapted to branch-line local runs in Silesia and Bavaria, and only electric locomotives have been used for hauling express trains. These new express services consist usually of two-car trains. The average speed of these cars is from 80 to 90 km. per hour, the maximum being 100.

Greenock.—TRAMWAYS FUTURE.—The *Electric Railway and Tramway Journal* reports that the employés of the Greenock and Port Glasgow Tramways Co., numbering 90, have received notices terminating their employment as from May 15th. The company's lease for the tramcars expired on that date, and at present it has a Bill before Parliament seeking powers for the abandonment of the system in whole or in part. For some time negotiations have been proceeding between Greenock Corporation and the company with a view to the tramcars continuing to run for several months until the company is able to substitute an adequate service of 'buses. At a recent meeting of the Corporation Tramways Committee it was intimated that the Committee had arrived at a stage whereby it hoped that the tramway would be continued at least until the company's Bill had been disposed of in Parliament.

Irish Free State.—DUBLIN.—The first section of the Lucan line of the Dublin United Tramways Co. was opened for traffic on May 14th.

Telegraph and Telephone Notes.

Algeria.—TELEPHONE SERVICE.—Merchants in Algiers are urging on the French Government the necessity for the establishment of a direct telephone connection between Algeria and Paris. In furtherance of the proposal, the motor traders of Algiers have decided to guarantee a minimum of twenty communications per day.

Colombia.—TELEGRAPH SERVICE.—The Minister of Posts and Telegraphs reports that the telegraph lines in Colombia have been considerably extended during the past financial year, their length having increased from 30,000 to 33,000 kilometres; at the end of June, 1926, there were only 22,000 kilometres of lines. The new cable service recently established between the port of Buenaventura and Bogota has already increased its messages by 130 per cent.—*Reuter's Trade Service* (Bogota).

East Africa.—RADIO-TELEGRAPHY.—The British East African Broadcasting Co. announces that its "Empiradio" wireless telegraph service between Kenya and Uganda stations and London will begin on June 1st. *The Times* was told at the General Post Office in London that the service to East Africa would not be available for the public until it had been subjected to tests which are to be made next month.

International Telephony.—LISBON-PARIS CIRCUIT.—Communication between Lisbon and Madrid and Lisbon and Paris, *via* Madrid, was opened to the public on May 17th, says *The Times*, which explains that besides the direct overland line from Madrid to Lisbon, a submarine telephone cable laid from Ayamonte to Villa Real de San Antonio establishes communication between the Spanish system and the South of Portugal. The line from Lisbon to Paris passes through Saragossa over the new high-frequency circuit, which has improved hearing between Madrid and Paris very considerably. When the Madrid-London service is opened in a few weeks Lisbon will also be able to speak with London.

ANGLO-DANISH SERVICE.—On May 19th the telephone service which has hitherto been available between all parts of Great Britain and Copenhagen, was extended to all parts of Denmark.

Persia.—TELEGRAPH DEVELOPMENT.—It has been decided to erect new telegraph lines where necessary and to extend existing lines to the Russian and Turkish frontiers; about a thousand miles of new lines will be needed, and most of the material has already been purchased in Russia.—*Reuter* (Teheran).

United States.—RADIO COMMUNICATION.—In the House of Representatives, the American Telephone and Telegraph Co. and also the Mackay system appeared before the Federal Radio Commission and asked for additional short-wave facilities, says the *Financial Times*. Mr. Frank B. Jewett, vice-president of the American Telephone and Telegraph Co., asked for three more channels to Europe to take the increased radio-telephone business, and also asked for one channel to South America. He explained that the Company planned an open radio-telephone service to the Argentine, from which, through land wire connections, such service would be extended to other South American countries. Mr. Charles E. Hughes, junior counsel for the Mackay system, told the Commission that the Mackay Companies planned an open radio-telegraph service from Paloal to California, to Honolulu, Guam, the Philippines, China, Japan, Australia, Dutch East Indies and Indo-China. The first link from Paloal to Manila was expected to be in operation by June 1st. He said the Mackay Companies had acquired control of the Sayville, Long Island, wireless station, and he asked for frequencies which would permit a radio service to England, France, Holland, Spain, Portugal, Egypt, the Republic of Georgia, Columbia, and Venezuela. Representatives of the Radio Corporation of America told the Commission they planned to open radio-telegraph circuits to Liberia, Cuba, Chile, Brazil, and also contemplated the establishment of a service to Japan, China, South Africa, Spain, Russia, Czecho-Slovakia, Switzerland, Syria, Australia, and New Zealand.

Radio Notes.

Aerial Risks.—DURHAM WARNING.—Rural authorities in several areas of County Durham are perturbed by the risk of wireless receiving aerials coming into contact with electric light and power overhead distribution lines, and notices have been issued in some instances warning users of wireless apparatus of the dangers they may run. At a meeting of the Cornforth Council the matter was raised on a report that a communication had been received from the Sedgefield Council enclosing a copy of a notice issued in its area, which pointed out that unless such wires were guarded to the satisfaction of the Council proceedings would be taken against the offenders. During the course of the discussion it was stated that one aerial complained about was placed below the Council's lighting wires, and that when the attention of the owner was called to it, he stated that he had been told by the Council's officials that it was quite safe. The question arose whether, in such a case, the Council would not be liable for compensation in case of accident. A member stated that during a gale the wires had come into contact while the wireless set was in use, and no ill-effects had been experienced. The Council decided not to send out separate notices to wireless-set owners, but to issue a general intimation that the Council would not be responsible for any accidents due to the contact of aerials with electric lighting wires.

Canada.—NATIONAL CONTROL.—In Parliament recently the Minister of Marine referred to the numerous complaints about existing conditions and the great number of concerns seeking to utilise the limited number of channels. He indicated that the way out may be, says *World-Radio*, a national system, such as Great Britain has.

LICENCES.—On March 31st, 1928, of the 82 broadcasting licences held in Canada, eleven were held by newspapers, eight by religious associations and churches, nineteen by radio and electrical firms, a number by broadcasting companies, and the remainder by private individuals, universities, financial and industrial concerns, and eleven by the Canadian National Railways.

Czecho-Slovakia.—REORGANISATION DEMANDED.—The Department of Overseas Trade is informed by H.M. Commercial Secretary at Prague (Mr. H. Kershaw, O.B.E.) that an inquiry was held on April 26th concerning the crisis in the wireless industry in Czecho-Slovakia. Representatives of dealers emphasised the fact that the number of listening licences had declined during March by 4,500, during which time 28 new concessions for the sale of wireless apparatus had been given. These facts were stated to be indicative of a general crisis in the industry, and the representatives demanded, as a means of alleviating the situation, that the law relating to wireless should be altered in a more liberal sense, and the broadcasting company reorganised to include representatives of the wireless dealers. On behalf of the Ministry of Posts, Dr. Kucera is reported to have said that the Government was planning an extension of the broadcasting stations. The Brunn station was to be extended in connection with the 10 years' anniversary celebration. The Prague station was to be strengthened to 50 kW, the Bratislava station was to be strengthened to 12 kW, and a new station of 10 kW was to be erected in Mahr. Ostrau. It was stated that to carry out the regional system in Czecho-Slovakia would require at least 20 stations, which would both exceed the allowance of stations for Czecho-Slovakia and not be a paying proposition. The following resolutions were passed:—(1) The Ministry of Commerce is urged to introduce an amendment of the wireless law (this was supported by Ministerial Councillor D. Kaufmann, of the Ministry of Commerce). (2) The wireless broadcasting company should be reorganised to include representatives of the wireless dealers and amateurs. (3) No more concessions should be granted in places where competition has already become too keen.

East Africa.—NEW SERVICE.—It is reported that the British East African Broadcasting Co. (Kenya and Uganda) is to commence broadcasting programmes locally on July 1st.

Receiving Licences.—STILL INCREASING.—The British Broadcasting Corporation announces that the April figures indicate an increase of 12,000 broadcast radio-telephone receiving licences over those for March, the total number in use being 2,491,911.

Rumania.—NEW STATION.—A new broadcasting transmitter is to be erected by the Marconi Company at Bucarest this year, the building of which will bring the number of countries in which such plant is being used up to 20. The Bucarest station will be operated by a recently-formed national company to which broadcasting rights in Rumania have been ceded; its working wave-length has not yet been decided, but the transmitter has been designed to broadcast on any wave-length between 200 and 545 metres. It will have a rating of 12 kW unmodulated energy to the aerial system, and will incorporate several new features of Marconi design. Before 1925 the use of private wireless sets was practically unknown in that country, but since the removal of restrictions a wide demand has grown up among amateurs and would-be listeners for a national broadcasting system; several wireless clubs have for some time been doing experimental work.

Russia.—BROADCASTING IN THE U.S.S.R.—Though there are now 77 wireless stations in the Soviet Union, with a total capacity of 180 kW, the increase in the number of receiving sets, whose number in the first quarter of this year was 200,000, does not correspond with the rate of development of the network of wireless stations. Accordingly, it is proposed to reduce the number of wireless stations, increase the power of those that will be left, and cheapen the price of receiving sets, so as to encourage wider distribution. Prof. Bonch Bruyevitch has produced plans for the construction of a central super station of 1,000 kW, whose range of transmission will be between 800 and 1,000 miles. The Wireless Friends' Society has a membership of some 200,000 amateurs and has 80 branches. As many as 80 wireless periodicals are published in the Soviet Union. From March, 1927, one section of the Wireless Friends' Society has been engaged in receiving and transmitting on short waves.—*Reuter* (Moscow).

Contract Information.

When "Contracts Open" are advertised in our "Official Notice" pages, the date of the ELECTRICAL REVIEW containing the advertisement is given in parentheses below.

Contracts Open.

Australia.—MELBOURNE.—July 17th. Postmaster-General's Department. Switchboard cable. (B.X. 4431.)*

Belfast.—June 2nd. Electricity Department. Continuous current switchgear for sub-stations. (May 18th.)

Bexhill.—June 7th. Electricity Department. English-made electric lamps for 12 months. (See this issue.)

Conisborough.—June 19th. West Riding Education Committee. Electric lighting installation at the New Middle School. Specifications from Education Department, County Hall, Wakefield.

Eccles.—May 26th. Electricity Committee. 350-kVA, three-phase oil-cooled transformer. Specification (£1 1s. deposit) from Borough Electrical Engineer, Electricity Works, Cawdor Street, Patricroft.

Grimsby. — June 14th. Electricity Department. One 10,000-kW turbo-alternator with condensing plant. (See this issue.)

Guiseley (near Leeds).—June 19th. West Riding Education Committee. Electric lighting installation at the new school. Specifications from Education Department, County Hall, Wakefield.

India.—June 5th. India Store Department. 264 miles copper-covered steel wire. (See this issue.)

Irish Free State.—DUBLIN.—June 13th. Electricity Supply Board. Supply and laying of 10,000-V and 380-V underground cables in the County of Dublin. (See this issue.)

Knottingley.—June 4th. U.D.C. Four electrically-driven vertical turbine pumps for sewage works. Specifications, &c., from Mr. C. R. J. Connor, Town Hall.

London.—CENTRAL ELECTRICITY BOARD.—June 29th. 132,000-V overhead transmission lines for the South-East England electricity scheme. (May 18th.)

H.M. COMMISSIONERS OF WORKS.—June 1st. Renewal of plates for a 500-Ah storage battery or, alternatively, a new battery for the Admiralty Research Laboratory, Teddington. (May 18th.)

METROPOLITAN ASYLUMS BOARD.—May 30th. Supply of electric lamps. Specifications from the office of the Board, Victoria Embankment, E.C.4.

Manchester.—June 8th. Electricity Committee. One 15,000-kVA transformer, 33,000/6,600-V outdoor type. (May 18th.) Five 125-kVA transformers for various sub-stations.

June 18th. Electrically-operated wagon tipper for Barton station. (See this issue.)

Newport (Mon.).—June 4th. Electricity Department. E.h.p. armoured switchgear and reactors and l.p. control gear. (May 18th.)

New Zealand.—WELLINGTON.—July 10th. Public Works Department. 50-kV switchgear and steelwork for Arapuni power scheme. (B.X. 4410.)*

July 17th. Two 12-ton trolley electric locomotives, four 4-ton ditto, seven 4-ton battery locomotives, with spares, two 150-kW motor-generator sets and switchgear, and overhead line equipment. (A. 6317.)*

Salford.—May 31st. Board of Guardians. Renewal of portion of electrical installation at Poor Law Offices. Specification from Mr. E. H. Inchley, clerk to Board of Guardians, Poor Law Offices, Eccles New Road.

Skegness.—Urban District Council. Switchboards, transformers, cables, &c., in connection with the bathing pool, piazza, boating lake, &c. (See this issue.)

South Africa.—CAPE TOWN.—June 13th. City Council. Insulated copper wire. (B.X. 4437.)* Electric light poles, cross arms, insulators, street lighting fittings, &c. (B.X. 4441.)*

*Further particulars can be obtained at the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, S.W.1.

Contracts Closed.

Aberdeen.—
Electrical work in connection with the additions to the Aberdeen City Hospital.—Bell & Robertson.

Ayrshire.—Glenafton Sanatorium Committee. Accepted:—
Electric lighting in connection with extensions (£1,172).—Cowan & Linton.

Basingstoke.—Electricity Committee. Accepted:—
Converting plant transformers, &c. (£2,491).—Crompton-Parkinson, Ltd.

Bedford.—Highways Committee. Recommended:—
Battery for electric vehicle (£188).—Chloride Electrical Storage Co., Ltd.
Electricity Committee. Accepted:—
Evaporator plant for increasing the capacity from 3,300 lb. to 7,750 lb. per hour (£1,355).—P. & B. Evaporators, Ltd.
H.p. valves (£88).—J. Hopkinson, Ltd.
Boiler valves (£44).—Dewrance & Co., Ltd.
Coal chutes and bunker valves (£72).—Babcock & Wilcox, Ltd.

Bexhill.—Electricity Committee. Recommended:—
Cable.—Enfield Cable Works, Ltd.
100 lamp columns (£198).—S. Pontifex & Co.

Croydon.—Electricity Committee. Recommended:—
Switchgear for Whitehorse Road sub-station (£676).—Reyrolle & Co., Ltd.
Two feeder switches and two transformer switches in connection with Beckenham supply (£673).—Ferguson, Pailin, Ltd.

Deal.—Town Council. Accepted:—
Electric lighting installation at the new pavilion (£295).—Crofts & Smith.

Edinburgh.—Corporation. Accepted:—
1,000-kW La Cour motor convertor.—Ateliers de Constructions Electriques de Charleroi.

Government Contracts.—The following contracts were placed by the various Government departments during April, 1928:—

ADMIRALTY, CONTRACT AND PURCHASE DEPARTMENT.
Motor alternators.—W. Mackie & Co., Ltd.
Aluminium sheets.—British Aluminium Co., Ltd.
Ammeters and voltmeters.—Everett, Edgcumbe & Co., Ltd.; Park Royal Engineering Co., Ltd.
Terminal fuse boxes.—W. McGeoch & Co., Ltd.; General Electric Co., Ltd.; Park Royal Engineering Co., Ltd.; H. W. Sullivan, Ltd.
Junction boxes.—Basebe, Sadler & Co., Ltd.
Electric light fittings.—W. McGeoch & Co., Ltd.
Telemotor fittings.—MacTaggart, Scott & Co., Ltd.
Motor generators and panels.—W. H. Allen, Sons & Co., Ltd.
Electric lamps.—General Electric Co., Ltd.
Electric lift.—W. Wadsworth & Sons, Ltd.
W/t receiving apparatus.—Baird & Tatlock (London), Ltd.; Gambrell Bros., Ltd.; Sterling Telephone and Electric Co., Ltd.; The Plessey Co., Ltd.; H. W. Sullivan, Ltd.; Radio Instruments, Ltd.
Resistances.—Park Royal Engineering Co., Ltd.; British Electric Resistance Co., Ltd.; Zenith Electric Co., Ltd.; Veritys, Ltd.; Dorman & Smith, Ltd.
Switches.—H. W. Sullivan, Ltd.; W. McGeoch & Co., Ltd.; Veritys, Ltd.; Whipp & Bourne, Ltd.
Switches and combined switches and sockets.—Edison Swan Electric Co., Ltd.; General Electric Co., Ltd.; Hawkers, Ltd.
Transmitters.—Gambrell Bros., Ltd.
Tuners and heterodyne units.—The Plessey Co., Ltd.; Radio Instruments, Ltd.; H. W. Sullivan, Ltd.
W/T valves.—Mullard Radio Valve Co., Ltd.
Welding wire.—J. Rigby & Sons, Ltd.; J. Royston, Son and Co., Ltd.

WAR OFFICE.

Portable secondary batteries.—Pritchett & Gold and E.P.S. Co., Ltd.

Lamp and battery cases.—C. F. Timbers.

AIR MINISTRY.

Underground cables, Cardington.—Cox-Walker & Partners, Ltd.

"Reid" type reaction apparatus.—Reid & Sigrist, Ltd.

T.22 transmitters and spares.—Gambrell Bros., Ltd.

POST OFFICE.

Telephone apparatus.—General Electric Co., Ltd.; International Electric Co., Ltd.; Phœnix Telephone and Electric Works, Ltd.; Telegraph Condenser Co., Ltd.; Telephone Mfg. Co., Ltd.

Testing, protective and miscellaneous apparatus.—British Thomson-Houston Co., Ltd.; Phœnix Telephone and Electric Works, Ltd.; Power Equipment Co., Ltd.; Sterling Telephone & Electric Co., Ltd.

Battery stores.—Accumulators of Woking, Ltd.; C. A. Vandervell & Co., Ltd.

Cable (various).—British Insulated Cables, Ltd.; Connollys (Blackley), Ltd.; Enfield Cable Works, Ltd.; W. T. Henley's Telegraph Works Co., Ltd.; Pirelli-General Cable Works, Ltd.; Siemens Bros. & Co., Ltd.; Standard Telephones & Cables, Ltd.

Joint box castings.—General Foundry & Engineering Co., Ltd.; United Steel Companies, Ltd. (T. Butlin and Co., Ltd.).

Cords for telephones.—Phœnix Telephone & Electric Works, Ltd.

Telegraphic ironwork.—Bullers, Ltd.; Guest, Keen and Nettlefolds, Ltd.; D. Willetts, Ltd.

Electric lamps.—General Electric Co., Ltd.

Earth plates.—G. Farmiloe & Sons, Ltd.

Wireless valves.—Mullard Radio Valve Co., Ltd.

Bronze wire.—T. Bolton & Sons, Ltd.; Elliott's Metal Co., Ltd.; R. Johnson & Nephew, Ltd.; Shropshire Iron Co., Ltd.

Cadmium copper wire.—T. Bolton & Co., Ltd.; R. Johnson & Nephew, Ltd.; F. Smith & Co., Ltd.

G.I. wire.—W. Bain & Co., Ltd.

Manufacture, supply, laying and jointing submarine cable: Lumps Fort (Portsmouth), Nettlestone (I.O.W.).—Siemens Bros. & Co., Ltd.

Telephone exchange equipment.—Putney: Standard Telephones & Cables, Ltd. Hayling Island, Leeds and Petersfield: Automatic Telephone Mfg. Co., Ltd.; Mansfield; General Electric Co., Ltd. Winchester: Siemens Bros. & Co., Ltd.

CROWN AGENTS FOR THE COLONIES.

Cables.—Callender's Cable & Construction Co., Ltd.; W. T. Henley's Telegraph Works Co., Ltd.; Standard Telephones & Cables, Ltd.

Copper wire.—Elliott's Metal Co., Ltd.; Shropshire Iron Co., Ltd.; Whitecross Co., Ltd.

Electric power plant.—English Electric Co., Ltd.

Electric generator.—National Gas Engine Co., Ltd.

Static transformers.—Johnson & Phillips, Ltd.

Telegraph line materials.—Bullers, Ltd.

Telephone apparatus.—General Electric Co., Ltd.

Valves.—J. Blakeborough & Sons, Ltd.

Irish Free State.—DUBLIN.—Department of Posts and Telegraphs. List of contracts placed by the Controller of Stores during the month of April, 1928:—

P.C.T. cable.—F. Routledge; Standard Telephones and Cables, Ltd.

Instrument cords.—International Electric Co., Ltd.

Flameproof wire.—Pirelli-General Cable Works, Ltd.

—*Irish Electrician.*

London.—ST. PANCRAS.—Contracts and Stores Committee. Two 1,000-kW motor convertors for Highgate Road sub-station and three 2,500-kW motor convertors for the new sub-station:—

Ateliers de Constructions Electriques de Charleroi	£21,850
BRITISH THOMSON-HOUSTON CO., LTD. (Recommended.)	26,757
Ditto (alternative)	28,328
Brush Electrical Engineering Co., Ltd.	27,540
British Brown-Boveri, Ltd.	28,080
English Electric Co., Ltd.	29,418
General Electric Co., Ltd.	29,248
Ditto (alternative)	29,805
Metropolitan-Vickers Electrical Co., Ltd.	29,899
Ditto (alternative)	30,404
Bruce Peebles & Co., Ltd.	30,945
Ditto (alternative)	32,001
Mather & Platt, Ltd.	32,600
Ditto (alternative)	33,714

E.h.p. switchgear for King's Road generating station (£4,833).—A. Reyrolle & Co., Ltd. (Recommended.)

LONDON COUNTY COUNCIL.—Highways Committee. Switchgear for Greenwich power station:—

	Cellular type.	Armourclad type.
ENGLISH ELECTRIC CO., LTD.	£39,241	£46,893 (Accepted.)
Do. (alternative)	44,714	80,878
Park Royal Engineering Co., Ltd.	46,724	—
General Electric Co., Ltd.	47,878	47,898
Ferguson, Pailin, Ltd.	—	52,050
Metropolitan-Vickers Electrical Co., Ltd.	—	54,032
A. Reyrolle & Co., Ltd.	—	55,205
British Thomson-Houston Co., Ltd.	—	56,220
New Switchgear Construction Co., Ltd.	—	60,927
Johnson & Phillips, Ltd.	62,020	62,760

METROPOLITAN ASYLUMS BOARD.—Overhauling and repairing two electric generating sets at Northern Hospital:—

LONDON GRAVING DOCK CO., LTD. (Recommended.)	£263
Harland & Wolff, Ltd.	299
Payne, F. G., & Co.	302
Pilot Engineering Co.	312
English Electric Co., Ltd.	Incomplete

ST. MARYLEBONE.—Electric Supply Committee. *Correction.*—Owing to a printer's error in the Committee's minutes the contract for the overhauling of an Oerlikon turbo-alternator was stated to have been awarded to the General Electric Co., Ltd. (*vide* our last issue). The contract has actually been placed with the makers, the Oerlikon Co.

CENTRAL ELECTRICITY BOARD.—Accepted:—

Switchgear in connection with the Central Scotland Electricity Scheme (£182,000).—Metropolitan-Vickers Electrical Co., Ltd. (£134,000).—British Thomson-Houston Co., Ltd.

Special river crossings of the Cart and Clyde and Forth (£33,000).—Foundation Co., Ltd.

(See our "Business Notes" pages to-day.)

WESTMINSTER.—Highways Committee. Accepted:—

Electric motor for stone crusher (£80).—City Electrical Co.

LONDON ELECTRIC SUPPLY CORPORATION.—Accepted:—

H.p. switchgear in connection with the bulk supply to Battersea Borough Council (£4,760).—A. Reyrolle and Co., Ltd.

Hornsey.—Electricity Committee. Recommended:—

600-kW rectifier set at Muswell Hill sub-station (£4,875).—Hewittic Electric Co., Ltd.

H.p. switchgear (£646).—A. Reyrolle & Co., Ltd.

L.p. switchgear (£354).—Park Royal Engineering Co., Ltd.

Portsmouth.—Tramways Committee. Recommended:—

Special points and crossings at Fratton Bridge (£2,808).—Hadfield & Co.

Swansea.—Education Committee. Accepted:—

Electric lighting installation at Llansamlet School (£308).—Mr. H. Norman Kirk (in place of withdrawn tender).

Taunton.—Town Council. Accepted:—

Two lead plate batteries, each with 42 cells, for electric vehicles, at £227 each.—H. N. Hickley.

Forthcoming Events.

Physical Society.—Friday, May 25th. Imperial College of Science, South Kensington, S.W. 5 p.m. Ordinary meeting.

Institution of Civil Engineers.—Charter Celebration and Engineering Conference, London, June 3rd to 7th. (See "Institution Notes.")

The "Electrical Review" Service Department.

INQUIRIES must be accompanied by a stamped addressed envelope.

We should be glad to learn the names and addresses of makers of the following:—

REGENT voltmeters for switchboard mounting.

Notes.

Sydney Bribery Charges.

Further evidence was heard last week by the Royal Commission which is investigating allegations of bribery made against Messrs. Babcock & Wilcox, Ltd., Mr. S. Y. Maling, deputy general manager of the Sydney (N.S.W.) Electricity Department, and former Labour members of the Sydney Corporation in connection with a large contract for power plant.

The Sydney correspondent of *The Times* reports that Mr. A. J. Arnot, the Australian manager for Messrs. Babcock and Wilcox, said that his company was the lowest tenderer for the contract in question. Mr. Maling informed him that if the company was to secure the order he would want £2,500 for himself and £5,000 for the aldermen. Later, one of the aldermen demanded £1,000 for himself. Maling afterwards said that a meeting of aldermen had decided that a payment of £10,000 must be made, or the tender would not be accepted, as International Combustion, Ltd., was prepared to pay £15,000. Mr. Arnot thereupon wrote privately to the managing director of the company, Sir James Kemnal (who has since died) stating that he wanted to have nothing to do with the contract; he would prefer Sir James himself to deal with the matter, while he would resign. Sir James replied that he was unable to go to Australia, but if their tender was satisfactory they would pay any "blackmail" which might be necessary. "I told Maling that if he would nominate someone in Sydney to receive the money, I would communicate with the managing director. The name given me at a later stage was that of Mr. Frank Buckle. Maling said he had to split the money among eight aldermen. When Maling gave me the name I wrote to Sir James Kemnal and told him the recipient was to be Mr. Frank Buckle, through a certain Sydney bank. I told him to send £10,000, and £600 for expenses; that would sufficiently discharge the matter as far as Maling was concerned."

The *Daily Telegraph* reports that on May 18th the Commission decided to investigate the statements relating to International Combustion, Ltd., as well as recent coal contracts.

Mr. Maling gave evidence, and stated that he received £9,500, of which £7,500 was paid to Alderman Green. He had always preferred the Babcock & Wilcox tender, although Mr. Forbes Mackay, the general manager, who was then in England, favoured that of International Combustion, Ltd. He maintained that he had offered Alderman Green the bribe because it was in the best interests of the Department that the work should proceed. Witness declared that Mr. James Taylor, Australian director of the International Combustion Co., told him that the general manager of the company, Mr. Hutchinson, had informed him (Mr. Taylor) that he had offered the aldermen £15,000 if they accepted his tender. Thereupon Mr. Taylor ordered Mr. Hutchinson to withdraw the offer, and sent Mr. Hutchinson back to England.

Mr. A. J. Arnot gave further evidence. He alleged that he was approached by a woman on behalf of Mr. Maling, who demanded that he should pay a further £2,600 in order to pay income-tax on the money received from London. Mr. Arnot refused this. The witness said he drew a distinction between bribery and blackmail. "I was morally justified in paying blackmail in order to secure a final decision on the tender," he said. "Bribery is giving money to get something done which should not be done. Blackmail is money forced out of you to get a man to do his duty."

The Royal Agricultural Show.

The British Electrical Development Association is organising a Conference on "Electricity on the Farm," to be held at the Royal Agricultural Show, Nottingham. A paper will be read by Mr. W. Riggs, A.M.I.E.E., at 12 noon, on Wednesday, July 11th, in the Members' Tent at the Show Yard, Nottingham. The Association hopes that electrical visitors to the Show will, as far as possible, arrange their visits on that date so as to enable them to be present at the Conference.

Appointments Vacant.

Plumber-jointer for the Ascot District Gas and Electricity Co. Meter tester and reader (63s.) for the Cheadle and Gatley U.D.C. Electricity Department. Relief charge engineer for the Whitehaven Corporation Electricity Department. Engineering assistant for the Fulham Borough Council Electricity Department. Charge engineer for the City of Norwich Electricity Department. (See our advertisement pages to-day.)

The Batti-Wallahs' Society.

On Wednesday last week the Batti-Wallahs entertained Mr. Ll. B. Atkinson, director and secretary of the Cable Makers' Association, at luncheon at the Hotel Cecil. The new president, Mr. R. W. Hughman, was in the chair. After luncheon, on the invitation of the chairman, Mr. Atkinson addressed the members and guests on the subject of "The Electrical Industry: Past, Present, and Future." Commencing with the electrical exhibitions at Paris and the Crystal Palace in the early 'eighties, he described the enthusiastic reception accorded to the new illuminant, which led young men and company promoters to jump into the industry—followed, unfortunately, by the State. Gradually the industry was built up, and all its fundamental features were in existence by 1890, but development was hindered by the rivalry of gas and cheap fuel. The Great War changed the situation; factories sprang up, fuel ran short, and electric power was indispensable. After the War fuel was dear, and consequently the electrical industry went ahead; between 1907 and 1924 electrical manufacturing increased five-fold, and the capital invested in the industry rose to some 800 millions sterling, with a turnover of 85 or 90 millions a year. To-day this country, which had always led in invention, possessed the greatest exporting electrical industry in the world; nevertheless it was not profitable, as it should be, owing to keen competition from other producing countries, where manufacturing and supply were closely linked with financial groups. In this country, largely owing to the municipal ownership of the supply industry, numerous small concerns competed for every order, with loss of efficiency. Co-operation had remedied many of the drawbacks of this system, and the industry was now well organised; the various associations co-operating with one another had exercised immense influence in bringing the industry to its present position.

Now they were going to equip everybody electrically; the unification of electricity supply on an economic basis was a vast improvement, and within 10 years would result in reducing the cost of electricity as a whole (if not in densely-populated areas). The effect on the manufacturing branches would be enormous. Distribution must be reorganised; large groups were gathering together small distributing undertakings for that purpose. An intensive campaign of public education would follow; domestic uses offered a most profitable and untilled field, in which systematic canvassing was extraordinarily successful. A weak policy had been followed in the past, propaganda not being followed up by a direct appeal. Contractors should combine their efforts for this purpose.

A hearty vote of thanks to the speaker was moved by Mr. G. W. Partridge, and carried by acclamation, after which a vote of thanks to the chairman concluded the proceedings.

E.A.W. Activities.

A well-attended meeting in connection with the Electrical "Outlet" Campaign of the Electrical Association for Women was held on May 17th, when Alderman Mrs. Hammer presided. A plan of a house was exhibited on which were indicated a number of "Outlets" shown in positions deemed suitable by the various E.A.W. Branches and the Executive Committee, and the plan was discussed, each room being taken separately. Generally speaking, it was agreed that the position of the "Outlets" should be near the door and near the window.

The Electrical Trades Benevolent Institution.

The annual general meeting of the E.T.B.I. was held at the Institution of Electrical Engineers, London, on Monday last. Mr. Archibald Page, president, I.E.E., occupied the chair, and in introducing the report of the Council, expressed his pleasure in assisting at that meeting; the Benevolent Institution, he said, was fulfilling a duty that was laid upon each of them. Their great industry was on the threshold of a great expansion, but hard cases were sure to occur, and he was glad that provision was being made for those who met with misfortune. The income from contributions during the year 1927 was £3,293, making with the receipts from other sources a total income of £4,714: after the payment of grants and expenses, £2,235 had been carried to capital account. The total invested funds amounted to £32,513. Thanks were due to the Newcastle Local Advisory Committee for its excellent work, and to the Engineers' Ball Committee and others for valuable assistance. During the year 221 grants were made, absorbing £2,049, as compared with 75 grants (£1,105) in 1926 and 81 grants (£934) in 1925. Every qualified applicant received assistance, and the Council endeavoured to find work for them. The annual Festival, over which Mr. J. W. Beauchamp presided, resulted in the collection of no less than £2,514. The Council again drew attention to the advantages of membership; the new class of subscriber (that of Associates) paid a subscription of only 5s. per annum and received the benefits of membership. The Council, under the new rules, had granted pensions to certain beneficiaries, thus giving them the advantage of an assured income. The assistance of the electrical Press was acknowledged, and Mr. Page referred to the appointment of Capt. J. T. Keeping as secretary to cope with the rapidly increasing duties, his remuneration for the first three years being met from sources entirely outside the funds of the Institution. New office accommodation had been taken at 9, Southampton Street, High Holborn, W.C.1. Moving the adoption of the report and accounts, Mr. Page remarked that the I.E.E. Benevolent Fund and that of the E.T.B.I. were closely in touch to prevent overlapping; their spheres of action were separate, and they were complementary to one another.

Mr. E. A. Gatehouse seconded the motion, which was carried unanimously, and Mr. A. G. Beaver moved a hearty vote of thanks to Mr. J. W. Beauchamp for his success as president of the annual Festival, which was seconded by Mr. J. E. Edgcombe and accorded by acclamation.

Mr. J. Eck, in moving the election of new members of Council, said the call for new blood circulated by the Press had proved effective, Messrs. E. E. Sharp and J. N. Stephens being nominated; there were seven vacancies, and he proposed that five members should be elected, leaving two to be filled by co-option by the Council, and this was agreed

to, the members elected being Messrs. R. W. Hughman, E. F. Johnson, P. A. Lundberg, E. E. Sharp, and J. N. Stephens.

The appointment of Capt. Keeping as secretary was confirmed, and Mr. R. W. Hughman moved a resolution expressing the highest appreciation of the invaluable services of Mr. F. B. O. Hawes as honorary secretary to the Benevolent Institution over a long period of years, and gratification at his consenting to continue to hold that office in the future; he said there was plenty of work to do now, but in the early days also a heavy burden rested on the hon. secretary. Latterly the number of grants to be made had increased threefold in one year, and the Council felt that it would be trespassing unduly on Mr. Hawes's time to expect him to cope with the rapidly-growing work attached to his office; hence a whole-time secretary had been appointed. Mr. Hawes was very fully occupied in other directions, and his responsibilities were expanding—nevertheless, he had consented to continue to act as honorary secretary.

Mr. J. Eck, seconding the resolution, described himself as the father of the Committee, being its oldest member; he had been in close touch with Mr. Hawes from the commencement, when he was chairman, and on resuming that office at a later date he was astounded at the amount of work that had to be done. The Institution was under the deepest obligation to Mr. Hawes for his untiring efforts. Mr. A. Page also paid a tribute to the merits of Mr. Hawes, and the resolution was passed with enthusiasm.

Votes of thanks to the hon. auditors, Messrs. Price, Waterhouse & Co., and to the hon. solicitors, Messrs. Sugden, Hextall & Beal, were passed, and they were re-elected to their respective offices; votes of thanks to the Press, and to the I.E.E. for the use of the room, were also accorded, and the proceedings closed with a similar compliment to Mr. Page.

It was announced that the president for the 1928 Festival would be Mr. L. G. Sloan.

An Electric Public-Clock Installation.

We learn that one of the residents of the city of Valparaiso, Chile, is presenting to his fellow-citizens a 4-ft. four-face "Pul-syn-etic" electric clock fitted with striking apparatus. The clock is placed in the central square of the city, on a handsome 30-ft. standard, quite close to the railway station, and commanding a very good view. Connected electrically to this clock is a 1-h.p. motor-driven siren which, by means of a contact maker in the time circuit, sounds automatically at 12 o'clock every day, and by this siren public and business-house clocks all over the city can be kept to uniform and correct time. The master clock itself is in the donor's private house, and with it a model time ball, which is operated by the local observatory, so that the master clock is checked to the second, when necessary. The master apparatus also controls a number of silent interior clocks in the house, and, lastly, a complete set of Westminster chimes, all of which are operated electrically. The whole apparatus has been manufactured entirely by Messrs. Gent & Co., Ltd.

Institute of Transport.

Several references to the value of electrical transportation were made at the seventh annual Congress of the Institute of Transport held at Liverpool last week-end, under the presidency of Mr. Roger T. Smith. The chief point of the controversy from the electrical standpoint, was the challenge of the petrol motor-'bus to the electric tramcar.

Mr. J. A. Brodie (joint engineer to the Mersey Tunnel Committee) referred to the need for modern equipment and raising the limits of safe speed for tramcars to 30 or 35 miles per hour. An interesting struggle was taking place in many towns, he said, between electric tramway systems and motor-'buses; the arguments for and against these systems depended on the sets of conditions obtaining locally. When the traffic was heavy and continuous and where cheap conveyance was of first importance, as was the case at Liverpool, the electric tramway, if operated with the best plant and in the best manner, would probably continue to furnish the best solution. Those responsible for motor-'bus design were making great and successful efforts to improve vehicles, whilst tramway authorities seemed generally content to jog along with uncomfortable, wobbling and noisy vehicles of out-of-date design, and in many cases unsuitable for the faster traffic required to-day.

Mr. T. Pierson Frank (Liverpool Corporation) said that the points of support of motor-'buses were more numerous and better based than the supports of tramway vehicles. There was urgent need for improved designs of tramway vehicles.

Mr. H. Mozley (general manager, Burnley Corporation tramways) and Mr. J. McDonnell (Birmingham Corporation tramways) also participated in the discussion. The latter referred to an order which had been placed by the Birmingham Corporation for 80 tramcars capable of travelling at a speed of 30 miles an hour. When the capital expenses on the tramcar were taken into account, and they were so much more than those of the motor-'bus, the latter vehicle became a serious competitor from the standpoint of costs. The contribution made by the tramcar to street maintenance costs was often overlooked. Birmingham tramcars maintained an average speed of 11 miles per hour.

Mr. J. A. Brodie said that tramway people would have to wake up and take advantage of new materials to reduce the weight of vehicles and increase safe travelling speeds. The tramcar must be made a much more stable vehicle.

The value of electric cargo-handling plant was emphasised in a paper on "The Mersey Dock Estate" by Mr. L. A. P. Warner, who said that when general cargoes with their large variety of consignments were involved the Board found that two appliances stood out as pre-eminently useful, namely, cranes of every description and runabout electric trucks. The Dock Estate had been electrified practically throughout and all new cranes used electrical energy for their motive power; there were also numerous stations for charging electric trucks on the quays. In some ports he believed that petrol loading-off cranes were in use and these might replace similar electric cranes eventually. They had certain advantages over the latter, but none were in use on the Mersey Dock Estate. For one thing there was a ready supply of electricity, and again great caution had to be exercised in the introduction of such appliances in sheds which might contain very large quantities of cotton and other articles of an inflammable nature.

M.E.T.A. Summer Meeting.

The first summer meeting of the Meter Engineers' Technical Association was held at Leamington Spa on May 19th, when 53 members and visitors participated in what proved to be a thoroughly enjoyable and successful function. Lunch was taken at the Crown Hotel, Leamington, after which the president, Mr. G. D. Malcolm, delivered a short address, which created such a healthy and enthusiastic discussion that the projected visit to the Spa and Baths had to be abandoned. Time was found, however, to visit the Gardens, where the patiently-waiting official photographer played his part before the party embarked in a fleet of cars *en route* for Warwick and Stratford-on-Avon. Tea at the Cadena Café, Leamington, followed by an informal entertainment, terminated the day's proceedings.

Inquiry Into Pit Explosion.

An inquiry was held at Halton, on May 21st, into the explosion at the Temple Pit, Templenewsam, Leeds, on April 13th, in which three men lost their lives. Medical evidence showed that the men died from asphyxia. John Jones, afternoon deputy, said that he found gas in the Nines and Tens Gate in No. 1 district on April 12th. There was less than 1¼ per cent. of gas in the Nines and Tens Gate, but at Gate End there was definitely 1¼ per cent. The regulation was that no electrical apparatus should be run when there was 1¼ per cent. of gas present. That was why when he found gas on the afternoon of the 12th he did not order the electric fan to be run. He considered it would have been dangerous. Prof. R. V. Wheeler, Professor of Fuel Technology at the University of Sheffield, spoke to having examined the switch of the electrical fan and having made certain experiments. In his opinion, it was of the highest importance that the electrical switches used in the mines should have flameproof covers, and this one had not. If the switch had been filled with oil to the level required there would have been no sparking. The switch was not a proper one to operate where gas was present, and so operated it was extremely likely that it was the cause of the explosion. The Coroner's jury returned a verdict of "Death from misadventure in an explosion caused through a defective electrical switch used for an auxiliary ventilating fan." They added that the switch was not the kind that should be employed in places where inflammable gas was likely to accumulate.

Institution Notes.

Institution of Electrical Engineers.

WESTERN CENTRE SUMMER MEETING.—The week-end summer meeting of the Centre commenced at Weston-super-Mare on May 18th with the annual general meeting; the membership is 644 and 10 meetings were held last session at Bristol, Cardiff and Swansea. Vacancies on the Executive Committee for the 1928-29 session have been filled as follows:—*Chairman*: Mr. W. J. Bache (Cheltenham); *Vice-Chairman*: Mr. E. G. Okell; *Committeemen*: Messrs. A. C. Baker (Bristol), H. S. Ellis (Gloucester), E. P. Knill (Bristol), Edward Jones (Bargoed), and J. Wayne Morgan (Cardiff). The dinner, at the invitation of the Weston-super-Mare and District Electric Supply Co., Ltd., at which Mr. C. G. Tegetmeier presided, was followed by dancing. On the Saturday the party travelled by motor-coach to Taunton, where the Mayor (Coun. H. Westlake) welcomed the visitors at luncheon. The municipal power station was visited, and tea was provided by the Corporation Electricity Department. Mr. A. J. Howard (borough electrical engineer) presented Mr. C. T. Allan (Cardiff, joint hon. secretary, Western Centre) with a pipe. The return journey to Weston was made by motor-coach, and the Centre dinner took place in the evening, Mr. C. G. Morley New, chairman, presiding. The meeting concluded with a visit to the University of Bristol Agriculture and Horticulture Research Station at Long Ashton on Monday last.

WIRELESS SECTION COMMITTEE.—The following gentlemen have been nominated by the Wireless Section Committee to serve on the Committee from October, 1928:—*Chairman*: Commander J. A. Slee; *Ordinary Members*: Mr. F. W. Davey, Lieut.-Col. A. G. Lee, Mr. E. B. Moullin, and Mr. P. K. Turner. The following gentlemen will continue to serve as

members of the Committee:—The President, I.E.E.; the chairman of the Papers Committee, a nominee of the Council, a nominee of the General Purposes Committee, Major B. Binyon, Capt. P. P. Eckersley, Dr. R. V. Hansford, Mr. J. Hollingworth, Mr. S. R. Mullard, Mr. G. H. Nash, Mr. C. E. Rickard, Mr. G. Shearing, together with one representative each to be nominated by the Admiralty, Air Ministry, General Post Office and the War Office.

SUMMER MEETING.—A circular has been issued containing details of the arrangements for the summer meeting at the Scottish Centre. The party will assemble in Glasgow on Monday, June 25th, and members who may wish to take part in the meeting, but have not informed the secretary of their intention, are requested to do so without delay.

The Institute of Metals.

At a general meeting of members of the Institute on May 8th, an invitation was presented on behalf of the American Institute of Mining and Metallurgical Engineers for the Institute of Metals to visit America and meet with the American body in 1932. The president of the Institute, Dr. W. Rosenhain, F.R.S., suitably acknowledged the receipt of the invitation, and indicated that it would be gladly accepted by the Institute. It is understood that a good attendance at the proposed meeting in the United States is expected.

Institution of Civil Engineers.

The centenary of the Incorporation of the Institution of Civil Engineers by Royal Charter will be celebrated by an Engineering Conference, from June 3rd to June 7th. On Sunday, June 3rd, members will attend a service at Westminster Abbey. On Monday a reception will be held at the Institution, when the president (Mr. E. F. C. Trench, C.B.E.), will deliver an address, and addresses will be presented; in the afternoon Sir J. A. Ewing, K.C.B., F.R.S., will deliver the James Forrest Lecture on "A Century of Inventions." On Tuesday the conference will be opened, and in the afternoon engineering works will be visited; a conversazione will be held in the evening. The whole of Wednesday will be devoted to visits to works. On Thursday, June 7th, the conference will be continued, and there will be further visits to engineering works; the proceedings will conclude with a banquet to the delegates in the evening.

We are asked to state that the meetings of the Conference will be open to members of other engineering societies, who may obtain cards of admission on application to the secretary; the visits to works, however, are confined to members of the Institution.

The Incorporated Municipal Electrical Association.

The completed programme of the forthcoming Convention at Bath, June 11th to 16th, has been issued; it follows generally the lines indicated in our issue of January 20th, 1928, p. 113, but the afternoon of Tuesday, June 12th, will be devoted to alternative visits to the bathing establishment, the City of Bath, and the works of Messrs. J. S. Fry & Sons, Ltd., and the official visit to the exhibition will take place on Wednesday afternoon. Thursday is styled "Women's Day," and will include a Women's luncheon, and a visit to the exhibition in the afternoon in place of a special meeting. On Friday afternoon the members will drive to Cheddar Gorge, or to Longleat.

The following papers will be read and discussed: "Administration of Electricity Supply Undertakings," by Col. A. Sinclair and Mr. J. W. Burr; "Distribution of Electricity in Cities and Towns," by Mr. L. Romero; "Distribution of Electricity in Rural Districts," by Mr. H. F. G. Woods; "Domestic Electrification: its Development and Requirements," by Messrs. J. L. Carr and J. D. Peattie; and "Selling More Electricity for Domestic Purposes," by Lieut.-Col. W. A. Vignoles, D.S.O.

Our Personal Column.

Electrical men are invited to enable us to keep readers of the "Electrical Review" posted concerning their movements.

At the annual meeting of the Barcelona Traction, Light and Power Co., held at Toronto, according to newspaper reports, Mr. WALTER GOW, K.C., was elected a director in place of Mr. Alfred Loewenstein.

The *Electrical News* of Canada states that one of the most remarkable tributes ever paid to an electrical man was the special meeting held by the Electric Club of Toronto on the occasion of Mr. H. H. COUZENS's recent brief visit to that city. Although the Club's season was closed, some 300 members assembled at short notice at the King Edward Hotel to meet him. Mr. Couzens relinquished his position as general manager of the Toronto Hydro-Electric System and of the Toronto Transportation Commission four years ago to become general manager and a vice-president of the Brazilian Traction, Light and Power Co., with headquarters in Rio de Janeiro. His visit to Toronto was a very brief one, and the luncheon was fixed on as the best means of enabling him to meet a large number of old friends in a short time.

As stated in our "Business Notices" to-day, Mr. H. E. ANGOLD, late of the Metropolitan-Vickers Electrical Co., Ltd., has joined Messrs. Smith Meters, Ltd., of Kennington, London.

Belfast Corporation has appointed Mr. S. CARLISLE, whose appointment as manager of the tramways terminates this month, as assistant to whoever is given the senior post, says the *Manchester Daily Dispatch*. His salary is to be £800 instead of the present £1,000.

Mr. L. J. HUNT, consulting engineer to the Electric Construction Co., Ltd., has removed his offices to 28, Victoria Street, Westminster.

Mr. H. V. POINTON, the chief engineer to the Swedish General Electric, Ltd., in India, will arrive in England on a short holiday early in June. His address during his stay will be care of the Swedish General Electric, Ltd., 5, Chancery Lane, London, W.C.2.

The London County Council Highways Committee recommends that Mr. M. F. ALLSOP, combustion engineer in the electrical branch of the Tramways Department, be promoted to the position of generating engineer at a commencing salary of £350 per annum (based on pre-war conditions).

Mr. CHARLES HENRY YEAMAN, city electrical engineer of Stoke-on-Trent, was married on May 16th at Christ Church, Wolverhampton, to Miss EVELINE MAY BOWCUTT, of the Wolverhampton Corporation Electricity Department.

Mr. R. DEASON, who was formerly in charge of the Radio Department of Metro-Vick Supplies, Ltd., Birmingham Branch, is now with the Europa Radio Co., 9, The Parade, Birmingham.

The Special Committee appointed by the Glasgow Corporation to consider the reorganisation of the Electricity Department met on May 18th for the purpose of interviewing the candidates on the short list for the position of general manager. The meeting was a prolonged one, eight applicants being interviewed. After sitting for five and a half hours the Committee reduced the short list to two. The selected candidates for the appointment are: Mr. HERBERT BELL, M.I.E.E., city electrical engineer, Hull; and Mr. W. H. DUFFETT, M.I.E.E., deputy electrical engineer and manager, Rotherham. One member, Bailie Munro, dissented from this decision. A special meeting of the full Electricity Committee is to be held to-day (Friday), when it is expected a recommendation to the Corporation will be made. The two candidates selected will be asked to attend this meeting.

The Special Committee on Superannuation has had before it a report regarding the health of Mr. MITCHELL, who recently resigned his position as general manager of the Electricity Department. The medical reports testify that he is unfit for duty, and is likely to be incapacitated for a considerable time. The Committee agreed to recommend that Mr. Mitchell should be superannuated on the usual terms and conditions. This means that Mr. Mitchell will be entitled to a retiring allowance of approximately £700 to £750 a year, based on his length of service and his salary at the time of his resignation.

Sir ALEXANDER ROGER has been elected vice-chairman of the British Insulated Cables, Ltd., and Mr. D. JOHNSON SINCLAIR has joined the board.

The Barnes Urban Council has increased the salary of Mr. G. C. LAW, assistant electrical engineer, by £50 per annum, with a further increase of £50 a year hence.

The Stoke Newington Electricity Committee received 44 applications for the appointment of borough electrical engineer. Six candidates came before the Committee, and three were selected to appear before the Council at Tuesday evenings meeting. After a brief discussion, Mr. Hedley Large, A.M.I.E.E., who had been in the employ of the Council for 21 years, and had acted as deputy borough electrical engineer during the periods of absence of Mr. Hann (now on superannuation and resident in South Africa through ill-health) was appointed. There was some opposition offered by Councillors, who thought that the interests of the undertaking would be better served if a quite new appointment was made, but the great majority showed their desire to make definite the position of a man of whom they had already had lengthy experience and who was described as a faithful and efficient servant.

Mr. J. W. ROBISON has recently retired from the position of works manager with the Pritchett & Gold & E.P.S. Co., Ltd. In a speech delivered at a function held in his honour, when a cheque was presented by the company and other gifts were made by the staff and workpeople, Mr. Robison mentioned that he had been connected with the manufacture of accumulators for the past 46 years. He traced the development of accumulator manufacture from the very early days, and referred to various interesting contracts with which he had been

connected typical of the varied applications of accumulators. He was sent to America, while some electric battery locomotive work was in progress for the Stratford-Manor Park tramway, in 1887-8, and ran the first electric tramway car in the streets of Buffalo. His reminiscences included particulars of his relations with the Elieson company, and Mr. George Pritchett, who engaged him as manager of Pritchett Bros.' accumulator department in 1892. The progress of the business amalgamating Pritchett & Gold, the E.P.S. Co., and ultimately Peto and Radford which to-day occupied so strong a position among British battery concerns, was mentioned. Mr. Robison said he retired with the satisfaction of knowing that Mr. Cyril Pritchett, the son of the founder, would carry on. Sir Archibald Gold (chairman of Pritchett & Gold & E.P.S. Co.) spoke in glowing terms of Mr. Robison's wonderful record and of the value of his services. Mr. C. R. D. Pritchett and Mr. W. Peto spoke on behalf of the directors and staff, and Mr. Bonsor on behalf of the workpeople.

Mr. F. L. CATER, of Nitrate Agencies, Iquique, Chile, is returning to Chile *via* New York, where, until June 21st, his address will be c/o Messrs. W. R. Grace & Co., Industrial Department, 7, Hanover Square, New York.

Obituary.—MR. H. J. READ.—Mr. Herbert James Read, who recently met his death through a light railway engine colliding with his car at a level crossing at St. Albans, was managing director of Read & Partners, Ltd., electrical engineers, of 53, Victoria Street, London, S.W. He was 59 years of age.

MR. T. E. GRIFFITHS.—We regret to learn that Mr. T. E. Griffiths, who was connected with the advertisement department of the *Electrical Times* for more than 25 years, died on Monday last after a long illness.

M. CRESCITZ.—The death occurred at Chelles, Seine-et-Marne, France, last month, at the age of 72 years, of M. Crescitz, late vice-director of the Bureau Internationale de l'Union Télégraphique. He retired in November last owing to ill-health, after being associated with the French Posts and Telegraphs for over fifty years.

DR. FELIX DEUTSCH.—The death occurred, suddenly, on Saturday morning last in Berlin, of Herr Felix Deutsch, chairman of the A.E.G. He had suffered from heart trouble for some years, and one paper suggests that the celebrations connected with his seventieth birthday five days earlier, the receipt of hundreds of telegrams and floral gifts, and the tribute paid to him in the Press throughout Germany so affected him emotionally that the long-standing complaint proved fatal. Another report suggests that his end was hastened by his anxiety and disappointment at the treatment of his company's representatives in Russia by the Bolsheviks, as he had been particularly interested in the movement for the development of German trade with Russia. Dr. Deutsch's A.E.G. connection dated back to the year 1883, and it is stated that he was chiefly responsible during 45 years for the building up and expansion of A.E.G. business activities throughout the world. In close association for many years with the late Dr. Emil Rathenau, the founder of the company, who died in 1915, he subsequently acted in equally close co-operation with his son, Dr. Walter Rathenau, and when the latter was murdered he became chairman of the board. Dr. Deutsch in his early days was in the banking profession, he developed an interest in industry, and helped to bring about the co-operation of banking and industry for which Germany was so conspicuous for many years. He was interested in the acquisition of the Edison lamp patent for Germany in 1882. He was an almost ceaseless traveller in other countries in the interests of his company, and his example in this respect is one that British electrical leaders will do well to consider.

He was vice-president of the German Central Association of Electrical and Technical Industries. Dr. Deutsch was a brother-in-law of Mr. Otto Kahn, the American financier.

The Times contains an announcement of the death suddenly, from heart failure, on May 21st, at Providence, U.S.A., of Mrs. ELLEN MURRAY EDMUNDS, widow of the late Henry Edmunds, of Hove.

DR. A. ALVIN.—*Reuter* reports that Dr. Alvaro Alvin, a distinguished X-ray expert, has died in Rio de Janeiro. "Dr. Alvin began his researches in 1895, and, notwithstanding the loss of both his hands, continued his labours for the benefit of humanity until a few days ago."

Wills.—Mr. J. MELLOWES, of Messrs. Mellowes & Co., Ltd., roof-glazing manufacturers and contractors, left £106,339.

Sir W. B. FORWOOD left £356,090 gross and £353,779 net personalty.

Financial Section.

New Companies, Returns of Share Capital, Debenture Changes, Reports of Electrical Companies, Dividend Results, Transactions in Stocks and Shares.

New Companies Registered.

Cheap Electric Power Corporation, Ltd.—Private company. Registered May 14th. Capital, £5,000 in 1s. shares. Objects: To carry on any business relating to electrical distribution for light, heat and power, &c. The subscribers (who are also provisional directors) are:—R. Wells, 17, Stanford Road, N.11, master printer; J. W. A. Webb, 46, Grange Park, E.10, printer's manager. Qualification, 50 shares.

Wireless Lights, Ltd.—Private company. Registered May 14th. Capital, £4,500 in 1,500 preference and 3,000 ordinary shares of £1 each. Objects: To acquire the business carried on at 1-3, Sun Street, E.C., as "E. V. Hayes-Gratze," and to carry on the business of manufacturers of and dealers in wireless lights, illumination and signs of all kinds, parts and accessories used in the manufacture of wireless instruments, &c. The first directors are:—H. Marryat, 40, Hatton Garden, E.C., engineer (chairman), E. V. Hayes-Gratze, 1, Gledhow Gardens, S.W.5, electrical engineer (both permanent). Solicitors: Hicks, Arnold & Bender, 25, Southampton Street, W.C.2.

F. Parks, Ltd.—Private company. Registered May 14th. Capital, £5,000 in £1 shares. Objects: To acquire the business of lamp shade manufacturers heretofore carried on by F. Parks, Ltd. (incorporated on July 21st, 1914), and to carry on the business of wholesale and retail manufacturers of and dealers in lamps and lamp-shades for electric and other lamps, &c. The subscribers (each with one share) are:—F. G. Parks, 59, Newman Street, W.1, lamp shade manufacturer; F. G. Parks, jun., 20, Finsbury Park Road, N.4, traveller. F. G. Parks is permanent director and chairman. Qualification: £100 shares. Solicitors: Cooper, Bake, Fettes, Roche & Wade, 6-7, Portman Street, W.1.

Ignition, Ltd.—Private company. Registered May 14th. Capital, £400 in £1 shares. Objects: To acquire from H. E. Fellows all his share rights and interest in the Letters Patent granted to him and J. Walters for an invention relating to a system of ignition for internal combustion engines, &c. The first directors are:—H. E. Fellows, "Waterside," Pevensey Bay, Sussex; A. C. Giton, 11, Queen Victoria Street, E.C.4; A. R. Jackson, "Sandgate," Cooden Drive, Bexhill; A. R. Noakes, 11, Stockleigh Road, St. Leonards-on-Sea. Secretary: A. R. Jackson. Registered office: Greed's Building Yard, Terminus Road, Bexhill-on-Sea.

Radiomaton, Ltd.—Private company. Registered May 12th. Capital, £100 in £1 shares. Objects: To carry on the business of manufacturers and repairers of and dealers in wireless, telegraphic, telephonic and photographic apparatus, valves, instruments, equipment, accessories, electrical and magnetic instruments and apparatus, &c. The subscribers (each with one share) are:—H. W. Hamlett, 49, Clarendon Road, W.11, company director; C. H. Sleigh, 3, London Wall Buildings, E.C.2, solicitor. Registered office: 3, London Wall Buildings, E.C.2.

Radio Slot Machines, Ltd.—Private company. Registered May 12th. Capital, £100 in £1 shares. The objects and all other particulars are similar to Radiomaton, Ltd., above.

Automatic Wireless, Ltd.—Private company. Registered May 17th. Capital, £100 in £1 shares. Objects: To carry on the business of manufacturers of and dealers in all wireless, telegraphic, telephonic, and photographic apparatus, valves, instruments and accessories, electrical, magnetic and radioactive instruments, &c. The subscribers (each with one share) are:—W. J. Knight, Kenwood, Field Close, Ruislip, Middlesex, company secretary; Enid M. Wood, 38, Playfield Crescent, East Dulwich, S.E.22, clerk. Registered office: 3, London Wall Buildings, E.C.2.

Spark & Co. (Worcester), Ltd.—Private company. Registered May 15th. Capital, £3,000 in £1 shares. Objects: To acquire the business of music publishers, &c., carried on at High Street, Worcester, as Spark & Co., and to carry on this and the business of manufacturers of and dealers in wireless sets and apparatus, and electrical equipment of all kinds, &c. The first directors are: E. W. Thomas, musical instrument dealer, and Mrs. F. S. Thomas, both of 89, High Street, Worcester. Registered office: 12, High Street, Worcester.

Victor Portable Wireless Co., Ltd.—Private company. Registered May 17th. Capital, £300 in £1 shares. Objects:—To acquire the business of wireless apparatus manufacturers heretofore carried on at 19, Featherstone Street, E.C., as "C. Phillips." The permanent directors are:—V. C. Phillips, 172, Dersingham Road, Manor Park, E.12; L. E. Warner, 7, Howard Road, Walthamstow, E.17. Registered office: 61, Charterhouse Chambers, Charterhouse Square, E.C.1.

Full Light Anti-Dazzle Lamp Co., Ltd.—Private company. Registered May 18th. Capital, £25,000 in £1 shares. Objects:—To carry on the business of manufacturers of and dealers in anti-dazzle lamps and devices, electric lamp manufacturers and dealers, &c. The permanent directors are:—P. Holmes, 1, Morshead Mansions, Maida Vale, W.9; J. Field, Great Central Hotel, Marylebone Road, N.W.1; F. S. Leuw, "Treval," Stormant Road, Highgate, N.6 (director of W. G. Clarke & Sons, Ltd.). Qualification, £250 shares or stock. Registered office: 211, Abbey House, Victoria Street, S.W.1.

Official Returns of Electrical Companies.

Hartley Engineering Co., Ltd.—Issue on April 30th, 1928, of £300 debentures, part of a series already registered.

Radio Service (London), Ltd.—Satisfaction in full on April 16th, 1928, of debenture dated July 25th, 1927, securing £125.

C. A. Besley, Bailey & Co., Ltd.—Mortgage on land and premises at rear of 249-251, Bute Street, Cardiff, dated April 23rd, 1928, to secure £800. Holders: Richard England, Ltd., West Bute Dock, Cardiff.

G. S. Hawker, Ltd.—Mortgage on 1-2, Purley-Downs Road, Purley, Surrey, dated May 2nd, 1928, to secure £550. Holders: Woolwich Equitable Building Society, 113, Powis Street, Woolwich.

Hadden & Pearce, Ltd.—Particulars filed of £1,800 debentures authorised April 18th, 1928, charged on the company's property, present and future, including uncalled capital, the whole amount being now issued. Satisfaction in full on April 19th, 1928, of debenture dated June 1st, 1926, securing £1,300.

P. Kay, Ltd.—Two debentures, both dated May 4th, 1928, to secure £1,000 each, charged on the company's undertaking and property, present and future, including uncalled capital. Holders: Mrs. C. Kay and P. Kay, 34, Craven Walk, Stamford Hill.

Uneeda Supplies Co., Ltd.—Particulars filed of £2,000 debentures authorised May 7th, 1928, charged on the company's property, present and future, including uncalled capital, the amount of the present issue being £1,000. Also issue on April 2nd, 1928, of £100 debentures, part of a series already registered.

Electric and Ordnance Accessories Co., Ltd.—Debenture dated May 3rd, 1928, to secure £20,000, charged on the company's undertaking and property, present and future, including uncalled capital. Holders: Broadway Finance & Investment Co., Ltd., West End Works, Birmingham.

Win-Sum Electric Diffusers, Ltd.—P. E. Slack, of 44, Bedford Row, W.C., ceased to act as receiver or manager on May 9th, 1928.

Foundation Co., Ltd.—Deposit on May 3rd, 1928, of deeds of part of Offington Manor estate, Broadwater, Worthing, to secure all moneys due or to become due from the company to Lloyd's Bank, Ltd., not exceeding £35,000.

A. Vandam & Co., Ltd.—Debenture dated May 10th, 1928, to secure £1,000, charged on the company's undertaking and property, present and future, including uncalled capital (except such part of the company's assets as is sufficient to pay the accounts of three specified creditors). Holder: H. M. D. Still, Onslow Court Hotel, South Kensington, S.W.

Edith Electrical Co. (Barber & White), Ltd.—L. G. Darling, of Albion House, 87-89, Aldgate High Street, Aldgate, E., was appointed receiver on May 10th, 1928, under powers contained in debentures dated August 11th, 1927.

City Notes.

Rees Roturbo Manufacturing Co., Ltd.

In their report for the year ended December 31st, 1927, the directors state that notwithstanding the severe competition which continued during the whole period, there was a gross trading profit of £4,378. After meeting debenture interest the net deficit is £8,599, but for the fifteen months ended December 31st, 1926, there was a net loss of £20,410. A capital reorganisation scheme has been formulated under which £22,000 standing to the credit of the depreciation reserve will be transferred to a general reserve account, while the capital will be reduced from £250,000 to £112,561. It is proposed to effect the reduction by cancelling 10s. of the preference shares and 19s. of the ordinary shares. The rate of dividend on the 5 per cent. cumulative preference shares will be raised to 7½ per cent., non-cumulative, and the shares will have participating rights up to 10 per cent. The reduction will be applied to the writing down of plant, patents, goodwill, &c., and the debit balance on profit and loss account. The unissued £1 shares will be divided—the preference into two and the ordinary into twenty.

Stock Exchange Notices.

Dealings in the following have been specially allowed by the Committee under Rule 159:—

Power Investment Corporation, Ltd.—£375 5 per cent. cumulative preference stock; £375 ordinary stock.

Ruths Steam Storage, Ltd.—225,000 "A" ordinary shares of £1 each partly paid and fully paid, Nos. 1 to 225,000.

Application has been made to the Committee to allow the following to be officially quoted:—

River Plate Electricity Co., Ltd.—£67,000 ordinary stock.

Shawinigan Water and Power Co.—70,800 shares of common stock of no par value.

Underground Electric Railways Co. of London, Ltd.—179,172 ordinary shares of £1 each fully paid, Nos. 5,148,753 to 5,327,924.

The undermentioned have been ordered to be officially quoted:—

Brazilian Traction, Light and Power Co., Ltd.—4,563,532 ordinary shares of no nominal or par value.

Folkestone Electricity Supply Co., Ltd.—40,000 ordinary shares of £1 each fully paid, Nos. 100,001 to 140,000.

Scottish Power Co., Ltd.—500,000 ordinary shares of £1 each fully paid, Nos. 250,001 to 750,000; and 100,000 6 per cent. cumulative preference shares of £1 each, fully paid, Nos. 250,001 to 350,000.

Shropshire, Worcestershire and Staffordshire Electric Power Co.—300,000 6 per cent. cumulative preference shares of £1 each fully paid Nos. 300,001 to 350,000 and 1,210,001 to 1,460,000.

National Electric Construction Co., Ltd.

The profit for the year ended December 31st last was £23,193, and after deducting debenture interest, &c., and adding £5,581 brought forward, there remains £23,255, which it is proposed to distribute as follows:—Special reserve, sundry debtors, £9,000; general reserve, £1,800; dividend of 10 per cent. (as in 1926), £6,800; carried forward, £5,655. The results of the tramway undertakings in mining and industrial districts, in which the company is interested, were adversely affected by the trade depression and the income from this source showed a decline. The £9,000 allocated to a special reserve is against a debt of £26,000 due by a subsidiary company which has suffered severely. The report mentions the death of Mr. James Taylor, who was a director of the Company, and states that Mr. F. E. Stanley, the chief engineer, has been appointed to the board. The meeting was to be held yesterday (Thursday).

Cork Electric Supply Co., Ltd.

At the recent annual meeting the chairman mentioned the directors' intention to capitalise part of the reserves. An extraordinary general meeting has been called for May 31st to consider resolutions providing for the raising of the capital by £25,000 and empowering the directors to capitalise any part of the reserves and issue it in the form of shares. At a subsequent meeting (June 19th) a resolution will be put forward providing that £34,500 of the reserve shall be capitalised and issued in the form of ordinary shares to existing ordinary shareholders or their nominees in the proportion of three new shares to each ten held.

Cawnpore Electric Supply Corporation, Ltd.

The surplus on working for the year ended December 31st last was £67,637, and after deducting debenture interest and adding £2,512 brought forward, there is an available balance of £58,037. From this, provision is made for depreciation and renewals, sinking fund, writing off share and debenture issue expenses, the preference dividends and interim ordinary dividends, leaving £14,910. It is proposed to pay a final dividend of 7 per cent. on the ordinary shares, making 10 per cent. for the year (as for 1926), and to carry forward £3,150. The total sales of energy rose from 19,533,971 to 24,741,660 kWh. Meeting: May 29th.

Chloride Electrical Storage Co., Ltd.

The accounts for the year ended March 31st last record a net profit of £185,097, as compared with £158,666 in 1926-27. A balance of £47,352 is brought forward, making £206,018. It is proposed to pay a final dividend of 5 per cent., free of tax, on the ordinary shares, making 10 per cent. for the year, together with a bonus of 3s., making a total distribution of 25 per cent., free of tax, against 20 per cent., tax-free for 1926-27. Of the balance £75,000 is put to reserve (making £300,000), £10,000 to employés' pension fund, and £1,800 to employés' benefit fund, leaving £59,822 to be carried forward. The meeting was to be held yesterday (Thursday).

Barcelona Traction, Light and Power Co., Ltd.

Mr. Miller Lash (a vice-president) occupied the chair at the annual meeting in Toronto on May 15th. He called upon one of the directors (Mr. D. N. Heineman) as representing the "Sidro" concern, a large shareholder, to speak on the work which was being carried out in Spain. Mr. Heineman said that the net production for the first four months of the year was about 194 million kWh, as compared with 182 million in the corresponding period of 1927. He said that the business carried on in Catalufia by the operating companies was considered one of the province's greatest economic assets.

Pacific Gas and Electric Co.

The gross operating revenue for the past year of this company and its associates were $54,712,227. The total net income rose from $21,471,515 to $25,445,591. After the payment of interest and dividends, including 8 per cent. on the common stock, a balance of $2,108,840 remains.

New Issue.

Industrial Rubber Manufacturers, Ltd., made an issue of 250,000 8 per cent. participating preference shares of 10s. each and 250,000 ordinary shares of 1s. each last week. The company's objects include the production of ebonite and the chairman is Lord Erskine of Restormel, a director of the Bournemouth and Poole Electricity Supply Co., Ltd.

American Telephone and Telegraph Co.

Last week this company offered to its stockholders 1,185,000 shares of common stock, at $100 per share, in the proportion of one to each six shares already held. The proceeds of the issue, which is said to be the largest ever made by an American corporation, are required for the financing of the operations of associated companies.

Consolidated Gas, Electric Light and Power of Baltimore.

A dividend of $¾ per common share has been declared in respect of the quarter ending June 30th.

Dungarvan (Co. Waterford) Electric Light Co., Ltd.

The directors of this company, which was formed five years ago, have just paid their first dividend—5 per cent. on the ordinary shares.

Ransomes & Rapier, Ltd.

The directors report a net profit of £2,111 for 1927, against a loss of £12,054 for 1926. The ordinary dividend is again passed.

Dorman, Long & Co., Ltd.

A dividend at the rate of 6 per cent. per annum has been declared on the cumulative preference shares in respect of the half-year ended March 31st.

Central Electric Supply Co., Ltd.

A total of nearly 144 million kWh of energy was purchased from the London Power Co., Ltd., during the past year. The year's accounts show a profit of £25,798. The standard dividend (£7 18s. 5.538d.) is to be paid, and £48 carried forward.

Burma Electric Supply Co., Ltd.

An interim dividend of 3 per cent. has been declared on the ordinary shares, against 4 per cent. last year.

Radio Corporation of America.

The accounts of this company and its subsidiaries for the first quarter of the current year show a gross income of $16,792,547 and a net surplus of $3,122,874.

Great Northern Telegraph Co., Ltd. (of Denmark).

The directors' report for 1927 refers to the competition between the cable and radio services. After mentioning that the Russian traffic has diminished owing to the Soviet Government's preference for radio-telegraphy, the directors consider that given equal rates and conditions the cable companies need not fear the competition of wireless telegraphy in its present stage of development; there is room for both if they work peacefully side by side. To meet competition in the Far Eastern traffic the company has adopted the policy of reducing rates to the level of the radio rates. Further competition is expected from Japan and China. Reference is made to the issue of bonus shares, for which sanction will be sought at the annual meeting on May 30th. The accounts show that the receipts were slightly higher, while expenses were reduced considerably. The result was a rise in the net revenue from £271,242 to £360,295. The addition of £192,624 brought forward makes available £552,920. The reserve and renewal fund receives £30,556, dividends and bonus (totalling 20 per cent.) absorb £300,000, and a balance of £219,308 is carried forward. The reserve and renewal fund now stands at £3,832,220, and the dividend equalisation fund at £1,059,686.

Belgian Company.

The *Société d'Electricité et de Mécanique* (*Thomson-Houston and Carels*) states that the net profit for 1927 amounted to 2,605,000 fr.; in order to strengthen the position, it is proposed not to pay a dividend. One of the features of the year was the impetus given to the exports.

French Companies.

The *Compagnie des Lampes*, which is an amalgamation of the lamp manufacturing branches of the Société Thomson-Houston and the Compagnie Générale d'Electricité, is increasing its dividend from 60 to 70 fr. per share.

The *Société des Forges et Ateliers de Constructions Electriques de Jeumont* reports a net profit of 13,620,000 fr. for 1927. The dividend is increased from 27.50 fr. per share in 1926 to 30 fr. for last year.

The *Compagnie Electro-Mécanique*, after having defrayed the interest on the loans, reports net profits of 9,926,000 fr. for 1927, as contrasted with 4,944,000 fr. in the previous year. It is proposed to pay a dividend at the rate of 7 per cent., this result comparing with no distribution for 1926.

Swedish Company.

The report of the *Telefon Aktiebolag L.M. Ericsson* states that the output of the telephone factory in 1927 had a value of 20.37 million kr., and that of the cable factory one of 4.11 millions, comparing with 15.34 millions and 3.81 millions respectively in 1926. The foreign subsidiary manufacturing and sale companies did increased business, and the foreign concession undertakings co-operating with the company improved their results. It is proposed to pay a dividend of 6 per cent., against 3 per cent. in 1926.

Stocks and Shares.

MONDAY EVENING.

THE tone in the Stock Exchange became very much more subdued towards the end of last week. Precisely what brought about the reaction is as difficult to define as it would be to state the reasons for the cumulative outburst of buoyancy that started towards the end of 1927. There must come a point, of course, at which saturation of capital is reached, and it may be that, with the Whitsun holidays ahead, with money getting a little dearer and with new companies appearing at a more rapid pace than ever, the public investor, and the speculator, too, have become a little wary in following the movements which have hoisted prices to levels obviously high. Within the past few weeks, the Wall Street and other American Stock Exchanges have played an increasingly prominent part in the markets, and, on a break occurring amongst some of the American favourites, the feeling of reaction spread to industrials in the British Stock Exchanges, with the result that a halt was called to the previous exuberant optimism.

Cable Issues Fall.

The reaction has been most pronounced, as is natural, in the stocks and shares which have recently enjoyed the biggest rises. International Holdings, which touched 350, came back to 310, and Hydro-Electrics, which were being eagerly bought at 84, incontinently dropped to 78. Brazilian Tractions, now quoted in their split form, four shares of no par value having been given for one share of $100, are lower on balance. Amongst purely British issues, Eastern Telegraph ordinary stock slumped abruptly, at one time touching 212, which compares with 248 earlier this month, and also with 150 in the first weeks of the present year. The expectations of those who were looking for an early announcement as to amalgamation between wireless, cable and beam systems have been cold douched by statements to the effect that there is no immediate intention of forming such a group, the result being that Marconis gave way sharply from the best, and cable stocks, as shown by the instance just mentioned of Eastern Telegraph, came down with a run. The impression prevails, however, that negotiations will be resumed, even if they are not already continuing, and that, in time, an agreement will be reached between the triple interests concerned in these methods of communication. Prices accordingly recovered to levels well above the lowest reached, though losses remain on balance as a result of the week's work. American Telephone and Telegraph, together with International Telephone and Telegraph shares, have given way in sympathy with the breaks in other American issues.

Marconi Fluctuations.

Marconi preference fell substantially more than the ordinary did. The shares were standing at a shade under £6 when violent selling started, and reduced the quotation to 4¼. The argument is heard in certain quarters that Marconi preference shares of £1 each should stand at exactly twice the price of the ordinary shares of 10s. each, but this fails to take account of certain important factors with which informed circles are well acquainted, and it is dangerous to draw analogies between the two classes of shares by a rule-of-thumb method. Marconi ordinary suffered less, by comparison, the drop in their case being from 71s. as the highest to 64s. as the lowest, and from the latter price there was a rally to 65s. bid. The debentures have been very spasmodic in their movements, coming down from 190 to 160. Canadian Marconis have also been fluctuating on an erratic plane, and are easier at 26s. 6d.

Labour Party's Motion.

Lively interest attached to the debate in the House of Commons this, Monday, night upon questions raised by the Labour Party in connection with the rumoured transfer of the Imperial cable and wireless services. The debate would have been more interesting still had it not been for the Prime Minister's announcement that the Government would be unable to make any statement until the Imperial Conference had finished its deliberations. This may postpone the matter until the end of June.

Traction Issues.

Brazilian Tractions in their split form, to which reference has already been made, stand at 63½, which is equivalent to 254 a week ago. On the week, therefore, the price is down some 8 dollars. British Electric Traction preferred ordinary has recovered a couple of points after its fall on the reduction of ¼ per cent. on the dividend. British Columbia Electric Railway Stocks are unchanged: up to the end of last week about 88 per cent. of the shares had accepted the offer made by the group which bid 315 for the deferred and 275 for the preferred. The sale, therefore, becomes operative, and payment is due on May 31st. Mexican Utilities issues are steady, there being a small improvement in Mexican Light and Power preferred shares.

The Underground group of railway stocks is inclined to be dull, with falls in Central London ordinary, Metropolitan, and Metropolitan Districts. Underground £1 shares went up another 6d., but the income bonds are 4 points down. Opposition has developed against the proposal of the Central London directors to allow an alteration of the status—for that is what it appears to mean—of the assented ordinary stocks, and the prices of the securities have been unfavourably affected by the discussion which has arisen in connection with the directors' proposals.

Fife Tramway Notes.

Amongst tramway issues, London and Suburban preference relapsed to 10s. 6d. and the ordinary to 3s. 3d. It may be mentioned that 5½ per cent. five-year notes have been offered by the Fife Tramway, Light & Power Company. Of these, £150,000 has been offered for sale, ranking after the company's £209,853 5 per cent. debenture stock. The notes will be repayable on December 31st, 1931, at 101, unless previously redeemed or converted, and the conversion rights entitle the holder to convert each £100 of notes into 50 Fife Tramway, Light & Power ordinary shares, and 50 of the company's 6 per cent. preference shares. The prices of the two shares both stand about 18s., so that, although there is nothing to be gained at present through the option, the latter might become valuable in course of time.

Home Electricity Shares.

The home electrical descriptions are steady, though there has been a slight reaction in a few of the recently popular provincial shares. For example, Lancashire Light & Power have gone back to 30s. 6d., and Midland Counties to 30s., showing a loss of 1s. and 1s. 6d., respectively. Yorkshire Electrics are a little easier at 33s. On the other hand, Clyde Valleys gained 1s., to 36s. Shropshire "A" rose to 34s. Profit-taking brought about a fall of 2s. 6d. in Bournemouth and Poole to 2½; Metropolitans declined to 2½. Small losses occurred in County of London ordinary in sympathy with the decline of Bournemouth and Poole; Electric Supply Corporation shares shed 1/16, going back to 52s. 6d. middle. The dividend is expected to be announced almost at once. London Electric, Charing Cross and Westminsters are all 6d. higher.

The Manufacturing Shares.

Siemens have lost 1s. of their last week's rise, going back to 23s. 6d. on selling now that the dividend and report are out. Metropolitan-Vickers ordinary fell to 31s. 3d. General Electric preference put on 1s., and the ordinary shares 6d., on the listing of the latter on the New York Stock Exchange kerb market. Brush ordinary further improved, hardening to 30s., but manufacturing shares as a whole have been somewhat neglected. Rubber shares are steady, and in the engineering group the disposition has been to let prices drop a trifle here and there, owing to sales by people who wanted to take profits, and also to the more cautious tone that has developed round the Stock Exchange markets.

Miscellaneous Movements.

Other movements that have occurred include rises in London Power 5 per cent. debenture to 101½, a gain of 3 points in Commercial Cable 4 per cent. debenture to 83½, and of 10s. in Great Northern Telegraphs to 41½. Indo-European Telegraphs at 42½ are 50s. to the good. Pennsylvania Water and Power at 88½, and Shawinigan Water & Power at 109 both gained a point. Perak Hydro-Electrics are stronger at 17s. 6d. Whitehall Electric preference moved up to 23s. 3d. Revival of activity in West Australian mining shares led to an advance, to 9s. 3d., in Kalgoorlie Electric Power shares. Reference to our price-lists will show that the stocks and shares connected with the electrical industries have escaped lightly in the malaise, which touched so many other markets of the Stock Exchange.

Share List of Electrical Companies.

	Nom. £	Dividend. 1926.	Dividend. 1927.	Price May 21, 1928.	Rise or fall.	Yield. p.c.
HOME ELECTRICITY COMPANIES.						
Bournemouth and Poole	1	14†	15	2½xr	—2/6	8 0 0
Brompton Ordinary	1	8‡	8½	25/6	—	5 9 10
Charing Cross Ordinary	1	8½	8½	27/-	+6d.	5 3 8
do. do. 4½% Pref. ...	1	4½	4½	17/6	—	5 2 10
Chelsea	1	8⅝	8⅞	26/6	—	5 5 8
City of London	1	10	10	29/-	—	4 16 7
do. do. 6% Pref.	1	6	6	23/-	—	5 4 4
Clyde Valley	1	8	8	36/-	+1/-	4 9 0
County of London	1	7½	7½	38/-	—2/-	3 19 0
do. do. 6% Pref. ...	1	6	6	23/-	—	5 4 4
Edmundsons' 7% Pref.	1	7	7	25/6	—	5 9 10
Elec. Supply Corporation	1	11	—	52/6	—3/16	4 3 10
Kensington Ordinary	1	8	8	26/6	—	5 5 8
Lancs. Light and Power	1	7½	7½	30/6	—1/-	4 18 3
London Electric	1	8½	8½	26/6	+1/-	5 5 10
do. do. 6% Pref.	5	6	6	5½	—	5 8 9
Metropolitan	1	8	9	23	—1/6	3 15 9
do. 4½% Pref.	1	4½	4½	17/6	—	5 2 10
Midland Counties	1	6	6½	30/-	—1/6	4 6 8
Newcastle-on-Tyne Ordinary ...	1	5	6	27/6	—	4 6 8
do. 5% Pref. ...	1	5	5	19/6	—	5 2 7
do. 7% Pref. ...	1	7	7	26/-	—	5 7 8
Notting Hill 6% Pref.	10	6	6	10½	—	5 11 7
North Met. Elec. 6% Pref. ...	1	6	6	23/-	—	5 4 4
St. James' and Pall Mall	5	8	8	27/-	+6d.	5 3 8
South London	1	8½	8½	26/6	—	5 5 8
South Metropolitan Pref.	1	7	7	1½	+1/16	6 3 0
Urban Ordinary	1	7	—	52/6	—1/8	2 13 2
do. 6% Pref.	1	6	6	1½	+1/16	5 6 8
Westminster Ordinary	1	8½	8½	27/-	+6d.	5 3 8
Whitehall Elec. Invst. 7½% Pref. ...	1	7½	7½	23/3	+6d.	6 9 0
Yorkshire Elec.	1	8	8	33/-	—6d.	4 17 0
HOME RAILS.						
Central London Ord. Assented ...	Stock	4	4	71	—1	5 12 8
Metropolitan	,,	8	8	69	—1½	4 7 0
do. District	,,	3½	4	74½	—1½	5 7 5
Underground Electric	£1	1½	5	26/6	+6d.	3 15 6
do. do. Income ...	Bonds	6	6	125	—4	4 16 0
TELEGRAPHS AND TELEPHONES.						
Anglo-Am. Tel. Pref.	Stock	6	6	100½	+1½	5 19 5
do Def.	,,	1½	1½	24½	—½	6 3 9
Automatic Telephone	1	10	10	45/-	—	4 9 0
Eastern Extension	10	10	10	22½	—½	*4 9 0
Eastern Tel. Ord.	Stock	10	10	225	—5	*4 9 0
Globe Tel. and T. Ord.	10	10	10	29½	—1½	*4 9 0
do. do. Pref.	10	6	6	11½	—	5 7 10
Great Northern Tel.	10	20	20	41½	+½	4 14 5
Indo-European	25	10	10	42½	+2½	*5 17 8
Marconi	10/-	5	—	65/-	—3/16	0 15 6
Marconi-Marine	1	8½	12½	50/-	—6d.	*5 0 0
Oriental Telephone Ord.	1	12	12	53/9	—	*4 9 8
United R. Plate Tel.	5	8	8	11 7/8	—¼	*3 10 0
Western Telegraph	10	10	10	22½	—½	*4 9 0
HOME AND FOREIGN TRAMS, &c.						
Anglo-Arg. Trams First Pref. ...	5	5½	5½	8½	—	7 4 8
do. do. 2nd Pref. ...	5	6	6	9½	—	7 17 4
do. do. 5% Deb. ...	Stock	5	5	78½	—	6 7 5
British Electric Traction Def. Ord.	,,	—	—	520	—	... ...
do. do. 8% Pref. Ord.	,,	8	7½	124½	+2	6 8 6
Brazil Traction	100	6	7	63½	—8	2 15 1
Brit. Columbia Elec. Rly. Pcs. ...	Stock	5	5	94½	—	5 5 9
do. do. Preferred ...	,,	6½	6½	268	—	*2 6 9
do. do. Deferred ...	,,	8	8	307	—	*2 12 1
do. do. Deb.... ...	,,	4½	4½	87½	—	4 17 2
London & Sub. Trac. 5% Pref. ...	1	Nil	Nil	10/6	—1/-	... ...
London United Tram Deb. ...	Stock	4	4	60½	—	6 12 0
Mexico Trams, 5% Bonds	—	5	5	90	—	5 11 0
Mexican Light Common	100	Nil	Nil	94½	—	... ...
do. 7% Pref...	100	Nil	7	84½	+1	8 5 8
do. 1st Bonds	—	5	5	83½	—	5 19 9
Yorkshire (West Riding)	1	Nil	Nil	7/6	—	... ...
MANUFACTURING COMPANIES.						
Babcock & Wilcox	1	13	15	67/6	—	*4 9 0
British Aluminium Ord.	1	10	10	47/-	—	*4 5 1
British Elec. Transformer Pref. ...	1	7	7	18/-	—	7 15 7
British Insulated Ord.	1	15	15	4½	—	3 12 0
Brush Ord.	1	10	10	30/-	+6d.	6 13 4
Callenders	1	15	—	4½	—	3 10 9
do. 6½% Pref.	1	6½	6½	23/-	—	5 9 5
Crompton Parkinson Pref. Ord. ...	1	—	—	17/6	—	... ...
Edison-Swan	£/-	10	10	10/-	—	4 0 0
do. 5% Deb.	Stock	5	5	90	—	5 11 0
Electric Construction	1	7½	—	31/3	—	4 18 0
Enfield Cable Pref.	1	7½	7½	26/3	—	5 14 9
English Electric	1	Nil	Nil	8/9	—	... ...
do. do. Pref.	1	8	Nil	11/3	—	... ...
Gen. Elec. Pref.	1	6½	6½	25/-	+1/-	5 4 4
do. Ord.	1	7½	—	39/6	+6d.	3 16 0
Henley	1	25	—	5½	—	4 9 0
do. 4½% Pref.	5	4½	4½	4½	—	5 6 0
India-Rubber	1	Nil	Nil	13/9	—	... ...
Johnson & Phillips	1	12½	10	43/9	—	4 11 4
Met.-Vickers Ord.	1	8	8	31/3	—1/8	3 16 10
do. Pref.	2	8	8	38	—	6 1 11
Siemens Ord.	1	7½	7½	23/6	—1/-	5 1 8
Telegraph Construction	12	10	10	20½	—	*4 10 11

* Dividends paid free of Income Tax.
† 4% of which was Tax Free

A Report on the Electrical Industry.

A Survey by the Balfour Committee.

(*Continued from page* 881.)

HAVING dealt with the industry as a whole, the report turns to some of the more important branches, *i.e.*, cables and wires, telephone apparatus and lamps, and then to "miscellaneous products." The following is a brief summary of the information given :—

Cable-Making.

Having explained that this section includes underground telephone cables, but generally excludes deep-sea telegraph cables, the report says that cable-making is one of the strongest and most consistently successful sections of the electrical industry. Its organisation is the Cable Makers' Association, whose 16 or 17 members claim over 90 per cent. of the production. During the war the manufacturing plant was extended, but as a good deal of the additional plant was unsuitable for peace purposes it was discarded. In 1925 the amount of plant was about double that in 1914. In 1924 the industry employed about 30,000 men, 5,000 women, and 1,700 youths. A table shows that the production of insulated wires and cables (excluding submarine) rose in value from £4,160,000 in 1907 and £5,400,000 (estimated) in 1913-14, to £15,752,000 in 1924. The C.M.A. estimates the 1924 *volume* of output as about double that for the year ended June 30th, 1914. Eighteen of the undertakings in the industry have an aggregate share and loan capital of between £15 and £16 million, and seven of these each have a capital of £1,000,000 or more. The industry is stated to have been financed in the past largely out of its own earnings and reserve funds, and therefore the capitalisation of reserves during the last six or seven years did not constitute over-capitalisation.

The demand for street mains and telephone cables is intermittent, which leads to a necessity for plant of large capacity which may have to stand idle between one contract and another. It is thought that intermittency in the demand for telephone cables might be relieved if the Post Office arranged programmes of purchase for some years ahead. The subject is reverted to in the later chapter on telephone manufacture. Raw materials are mainly imported, and nearly all the cable works are situated so as to take advantage of water-borne traffic. Copper, which probably constitutes about half of the value of the products, comes almost entirely from the United States, but the paper used is mostly of British manufacture. The policy of combination is said to have been so far successful that although Continental manufacturers may quote lower prices, the British product has held its position largely because of its high quality; and the avoidance of losses due to internal competition has had its effect in maintaining the prosperity of the industry. The C.M.A. collects and distributes to its members information and data, and was concerned in the formation of the British Electrical Development Association and the Telephone Development Association. The workpeople are mainly of the semi-skilled class, training being acquired by a gradual process of advancement as the worker's experience increases. The wages are high in comparison with those paid in other industries for a given degree of skill. The 47-hour week is general, but some factories work on a two- or three-shift system; the latter is preferred by the workers. The piece-work system of payment is not generally regarded favourably by the manufacturers, as speed of output is secondary in importance to the exercise of the greatest care. The output per hour is said to be very slightly lower than in pre-war days but, broadly, it appears that both in quality and quantity the output is satisfactory and there have been no complaints as to restriction of output or unreasonable limitation of overtime. The relations between employers and workpeople are very good, and differences have been adjusted as they have arisen. There is a Joint Industrial Council for the industry with two District Councils covering northern and southern firms respectively. The Council has worked smoothly, and has enabled the industry to pass without friction or trouble through the difficulties of the post-war period.

The first efforts in the direction of standardisation were made by the C.M.A. at the beginning of the century, and more recently it has co-operated with the B.E.S.A. Consequently there has been a steady reduction in the number of patterns and styles, and the war enabled the manufacturers to carry this further, and a new series of standard sizes was evolved which reduced by about a-half the number of sizes which had to be stocked. It has been stated that this alteration made it possible for one company to reduce its holding of copper by £10,000. It was found possible to devise one series of wires in British measurements which were practically entirely usable for the sizes current in countries using the metric system, facilitating the application of British standards abroad. This standardisation has also been carried into the matter of quality, and it is stated that buyers the world over are prepared to pay rather more for a product backed by the Association's marks. The principal companies carry on research in their own laboratories, and, in addition, the C.M.A. firms contribute to and assist the B.E.A.I.R.A. The industry takes a broad view of research, considering that any development in electrical technique must eventually improve the sales of cables by creating a greater demand for electricity. The instance is quoted of the Research Association's determination of the permissible loading of standard paper-insulated cables which has saved the supply industry many thousands of pounds. Generally speaking, technical advances have been made available to the whole industry, but where patents have been obtained they have been made available by licence to members of the C.M.A., and in some cases foreign firms are paying patent royalties to members of the Association.

In dealing with the industry's selling arrangements the report refers to the practice of basing prices on the prevailing prices of copper and lead. For some 20 years the Association has had common prices and terms for standard qualities of cables, and it has special agreements with the Electrical Wholesalers' Federation and the Electrical Contractors' Association. Outside manufacturers endeavour to sell at prices a little below those fixed by the Association. An inquiry in 1921 showed that customers were content to pay the higher price as being in the nature of an insurance against interruption of supply. At the same time it was said that certain non-associated firms were able to produce cables no less reliable. In the home market up to a few years ago cables were sold direct to users, but when it was found that factors were becoming the agents of foreign manufacturers, agreements were made assigning them a definite position as suppliers to the smaller class of buyer. The majority of cable makers have branch houses or reliable agents in overseas markets, although merchants have done overseas business to a certain extent. The 1913 exports of cables (including submarine types) were valued at £3,577,700. The total rose to £5,425,000 in 1923, and in 1925 was £4,972,200. In 1913 the British Empire took two-thirds of the total, whereas in 1925 its proportion was just over half. The exports are fully analysed as to destinations, and it is seen that the United States has been the best customer since the war; in 1923 her share was valued at £2,135,300, but it fell to £767,100 in 1924 and £480,100 in 1925. Australia has consistently been the best Dominion market. It is mentioned that cable factories, in which members of the C.M.A. are interested, have been opened in India and Australia. An analysis of cable imports, which rose in value from £512,900 in 1913 to £797,800 in 1925, shows that Germany has remained the principal supplier, although up to 1925 she had not regained her pre-war position.

Telephone Manufacture.

It is noted that this section of the electrical industry overlaps other branches, particularly cable-manufacturing. There are about 15 makers of telephone plant in this country, but the bulk of the large exchange equipment is produced by some half-dozen companies. In addition, there are many firms making auxiliary equipment and materials. The chief home buyer is the General Post Office, which took over the National Telephone Co.'s system in 1912, when it had been allowed to deteriorate to some extent and was loaded to its fullest capacity. Soon after this the war began, and development was delayed. At the end of 1927 there were 1,634,000 telephones in use in Great Britain. At the end of the preceding year the number of telephones per 1,000 inhabitants was 34, and a table is given comparing this with the figures for other countries. Reference is made to the work of the Telephone Development Association whose membership comprises manufacturers of telephone apparatus and suppliers of materials to the industry. The Association maintains that the Post Office should announce a programme of development over a period of, say, five years. Then manufacturers would be in a better position to undertake the extension of factories and the engagement of more workpeople. The report refers in this connection to the three-year programme, involving an expenditure of £35,000,000, proposed by the Postmaster-General in 1925. The industry is said to be well advanced in the direction of standardisation and large-scale production. The rapid development of broadcasting has been of assistance to those firms in the industry which make wireless apparatus.

The pre-war and post-war exports of telegraph and telephone apparatus are set out in a table. The total (including wireless apparatus, excepting valves) was £290,000 in 1913; by 1925 it had risen to £2,831,300, of which radio apparatus (not separately shown in 1913) represented £1,106,400. Broadly speaking, about half of the exports went to foreign countries both before and after the war. Australia has continued to be the principal importer. Before the war Brazil and Argentina were the chief foreign buyers, but in 1925 they were both a long way behind Japan, whose share amounted to £478,400, against Australia's £817,900. Supplementary figures for 1926 show a total of £3,126,800, of which Australia took

£674,000, Argentina £567,000, and Japan £331,000. The total further declined to £2,677,700 in 1927. There has been a considerable development in the world market for these products, and the British manufacturers have undoubtedly taken a leading position in supplying the demand. Their success is attributed chiefly to the technical qualities of their products. It has been observed, however, that export business has been stimulated by the adoption of the automatic telephone system abroad, and doubts have been expressed as to the maintenance of the external demand arising from this cause. The growth of radio communication has also been a factor of considerable importance. Another table shows that imports rose in value from £251,800 in 1913 to £835,700 in 1925. In the former year Sweden and Belgium were the principal suppliers, with Germany third, but by 1925 their proportions had diminished, while Germany's had risen to ten times the pre-war amount. The share of the United States had also increased sevenfold. These two large increases were due to the development of the radio business—this class of apparatus accounted for 78 per cent. of the 1925 total.

Electric Lamp Manufacture.

A brief review of the history of the incandescent electric lamp opens this chapter, and it is mentioned that the bulk of the lamps made in this country are produced by a few large concerns. As these companies also make other goods, it is difficult to estimate the capital employed in the industry. At the close of the war the estimated value of the installed machinery was about £550,000, and since then plant valued at £1,500,000 has been installed. In December, 1924, the workpeople in the lamp and glass works owned by members of E.L.M.A. (which claims to represent about 90 per cent. of the production) numbered 4,782, of whom 3,076 were females. Before the war the annual output of British manufacturers was about 25 million lamps; this was about a quarter of the German output, which, in turn, was lower than that of the United States. During the war the Dutch industry developed, and now surpasses the British production. In 1926 the British output was 36 millions, and in 1927 41 millions. The present collective annual output of European lamp factories (including British) is about 200 millions. Great Britain was third among the European countries in 1925 as regarded consumption, Germany and France leading. The manufacture of flashlight lamps in this country is being persevered with in the face of the keenest foreign competition which is aided by large production and low costs. The report next deals with the constitution and objects of the Electric Lamp Manufacturers' Association, and states that at present licences covering about a hundred patents and rights on resulting improvements are at the disposal of its members on payment of royalties, while the exchange of factory and research experience is proceeding. Reference is made to the large use of automatic machinery which permits of the employment of female labour to a very great extent. It is stated that the large number of voltages in vogue in this country has militated against standardisation in this respect, although in other directions British manufacturers are in a very advanced position. The annual expenditure upon research is estimated at £100,000, of which probably more than half is spent by one or two firms. Fundamental research has been responsible for more important advances than gradual evolution. The spreading of the cost of research over a comparatively small production considerably increases overhead charges. The great growth of thermionic valve manufacture is due in a large measure to results obtained in lamp research, and many smaller industrial advances have also had their origin in this research. The E.L.M.A. selling arrangements are referred to, it being pointed out that discount rates increase with quantity and with undertakings regarding non-Association lamps. International selling agreemnts and arrangements for promoting the use of lamps and efficient manufacture are touched upon, and so are the import duties upon filaments and bulbs. It is noted that the international agreements limit the significance of the foreign trade figures, but a table is printed showing that exports rose from a pre-war value of £152,500 to £510,800 in 1925. Roughly, five-sixths of the 1925 exports were to parts of the British Empire, Australia being the chief customer. The number exported rose from 3.1 to 7.0 millions. Exports in 1926 were £501,000, and in 1927 £593,300. Retained imports rose in number from 2.7 millions in 1913 to 21.7 millions in 1927, Holland, Germany and Austria being the principal suppliers.

Miscellaneous Electrical Products.

Batteries and accumulators are first dealt with in this section, and it is shown that although exports of these have increased fairly rapidly, retained imports have also grown to large dimensions. The bulk of the exports consist of accumulators, but most of the imports are batteries for flashlamps, radio apparatus, bell and telephone work, &c. The British Empire's share of exports has increased slightly since the war, and was about 70 per cent. in 1925 and 1926. The principal source of imports was Germany, but the United States, the Netherlands, France, and Denmark are of importance in this connection. Exports of electric lighting fittings and accessories are well ahead of the imports, which come mainly from Germany and the United States. It is shown that exports of electrical instruments (including house-service meters) did not increase during the period 1923-27, although imports rose.

Carbons, while quantitatively not of serious significance, are of importance from the national standpoint. Exports rose from £10,100 in 1913 to £24,600 in 1927. The proportion taken by foreign countries has risen considerably. Retained imports were valued at £154,500 in 1913 and £93,400 in 1927. Practically the whole of the furnace electrodes come from the United States, while Germany and Austria supply most of the lighting carbons. The production of arc lamp carbons was developed during the war, and the peace-time requirements could all have been met by existing works. Nevertheless, and in spite of an import duty, imports increased, and part of the home manufacturing plant was closed.

A table shows the foreign trade in X-ray tubes, radio valves, and vacuum tubes. Comparable pre-war figures are not available, but it is seen that the total exports rose from £39,500 in 1922 to £181,100 in 1926, and retained imports from £25,500 to £141,600. Radio valves form a very large proportion of these totals. The total production of thermionic valves in 1924 was valued at £1,512,000. The export figure for that year is not available, but in 1925 the value of exports was £183,300.

(To be concluded.)

The Trade Position in Poland.

Increased Industrial Activity.

A REPORT upon Polish affairs has been prepared for the Department of Overseas Trade by Mr. R. E. Kimens, C.M.G., British Commercial Secretary at Warsaw (Stationery Office, 1s. 6d. net). Mr. Kimens says that, compared with the preceding years, 1927 was a period of marked prosperity in all the domains of the economic life of Poland, of increased consolidation and general stabilisation. This was due not only to such economic factors as good crops and enhanced industrial activity, but also to the policy and stability of the Government. The improved situation enabled the Government to float its first large foreign loan, and it is hoped that it will be followed by further loans, which are indispensable for the development of the country's natural resources, the construction of railways and public works, and the expansion of trade and industry.

A notable feature of Poland's foreign trade during 1927 was the very large rise in imports. Whereas in 1926 exports amounted to £51,774,000, and imports to £35,489,000, in 1927 the respective figures were £57,855,000 and £66,622,000, converting a "favourable" balance of £16,285,000 into an "adverse" one of £8,767,000. The growth in imports is explained primarily by the larger purchasing power of the country, following greater prosperity, and the industrial development, necessitating the importation of machinery, &c., for the erection of new plants and the modernisation of old ones. Although the excess of imports over exports is regarded as natural, steps are being taken in the direction of restoring greater equilibrium.

The value of Great Britain's share of the import trade in 1927 was not far short of the value of her share of Poland's exports, whereas in 1926 imports into Poland were considerably less than half of the value of exports from Poland to this country. This improvement is attributed to a number of factors, including the greater interest shown in the market by the United Kingdom; more favourable conditions for entering into the market owing to the better economic conditions and greater prosperity; the continuance of the German-Polish trade "war"; and the greater readiness of British firms to adopt on a larger scale the local methods and usages for their trade in Poland. Mr. Kimens says that in all directions there is a desire to enter into closer commercial relations with Great Britain, and that no efforts should be spared to maintain and strengthen the position which British trade has gained in the Polish market in the face of heavy odds. He stresses the requirements that prices must be competitive; credit should be granted upon adequate security; firms should be represented by reliable agents; and goods must be adapted to the local taste. He gives a list of articles for which there is a market in Poland; this includes copper wire and cable-making machines, electric lamp-making machines, turbo-generators, compressors, pumps, fans, electrical prime movers, large motors and dynamos, general electrical plant, switchboard equipment, boilers, coal-cutting machines, and vacuum cleaners, floor polishers, and other domestic appliances. Later, however, he says that considerable activity prevailed throughout 1927 in the mechanical and electrical engineering trades; the quality of manufactures is steadily improving, and they cover from year to year a larger range of articles, so that the scope of business for foreign firms is gradually becoming smaller.

The Polish Government gave last year greater financial assistance for the carrying out of public works, as a result of which a large number of schemes were executed, and

at the end of the year great activity prevailed in this branch of the economic life of the country. Among other developments electric power stations for lighting and technical purposes have been erected in numerous towns and communes. Most of the schemes have been carried out by Polish capital; as the financial situation of the municipalities has improved very considerably, no special difficulty was experienced in raising the necessary funds. This field offers therefore an opening for British enterprise, provided that the following considerations are borne in mind:—All materials, machinery, plant, &c.. which are obtainable locally, must be purchased in Poland, and those which have to be imported must be competitive from the point of view of price, and be of good quality; credit must be granted and Polish labour must be employed.

The telephone service has been extended, but the bulk of the supplies for this and the telegraphs were either made in Poland or imported from Sweden and Austria. Broadcasting stations were opened during 1927 at Krakow, Katowice and Poznan, the plant for the first being British. The number of licences has risen rapidly (it was about 150,000 at the end of last year), and the sales of foreign apparatus are growing accordingly. The prospects of an increased importation of British apparatus are said to be encouraging.

The Overhead Lines Association.

A Discussion on the Possibilities of Standardisation.

A MEETING of the Overhead Lines Association was held at the Institution of Electrical Engineers, London, on Wednesday, May 16th, Mr. R. Borlase Matthews (President) in the chair. The President called attention to the issue by the Electricity Commissioners of the new overhead line regulations, forms E.L.C. 53 and E.L.C. 53a, and said that they were welcome as affording a very considerable relaxation from the previous ones, although he was sorry to say that as regarded rural lines they were not so satisfactory as many members of the Association would have liked. Nevertheless, the new regulations would mean a reduction of from 12 to 30 per cent. in the cost of construction of these lines, and the Association very much appreciated the efforts of the Electricity Commissioners, bearing in mind their heavy responsibility as regarded safety generally. No doubt as experience was gained there would be further concessions.

Standard Overhead Lines.

Mr. D. C. REDFERN (Lothians Electric Power Co.) then read a paper on "Standard Overhead Lines: their Advantages, and the Number of Different Standards Required." The author said that when travelling about the country one could not help noticing the different types of construction which had been adopted for overhead lines by various authorised undertakers. Until the last few years only a comparatively few undertakings had used overhead lines, and therefore the design and erection of them in this country had been in the hands of a small number of engineers. Apparently, however, there had been a good deal of difference of opinion amongst engineers as to the best type, and until recently there had been very little published on the subject in this country.

It was not intended to put forward any definite suggestions as to the ideal line, said Mr. Redfern, but the adoption of certain definite standard specifications would lighten labour in designing lines and give engineers an idea as to what was considered the best possible line. There were also such questions as the best method of earthing the pole ironwork and the size and type of earth-plates. Further, there was no definite ruling in the country as to the spacing of conductors relative to sag, and therefore when designing the long spans often necessary in traversing hilly country, there were few available data to work on, and each engineer had to act upon his own judgment. Whilst the length of span on e.h.p. lines was usually limited by the pole strength where single poles were used, it was the ground clearance which limited it with A poles. With 0.075-sq. in. three-wire lines, a stout single pole would carry approximately 80 yards, while a 36-ft. A pole would give ground clearance with 105 yards. The cost of similar lines, one using 36-ft. A poles and the other using stout singles, with A poles interspered to stiffen the line, was approximately the same, and while longer spans could be used on higher A poles, the question of lines swinging together had to be taken into account; it was suggested that a definite ruling as to the use of A poles and single poles would be of decided advantage to all overhead-line engineers. If the Commissioners would accept the statement that a line was to be constructed to a standard specification, the work involved in preparing the necessary papers for the Commissioners' consents would be greatly simplified. Considering l.p. lines, at the present time they had split neutrals, V guards, a kind of cage guard, and various other devices for earthing a fallen wire. Each of these types had its own good points. Could not they standardise and say definitely which was the best and cheapest? This would have great advantages both from the manufacturer's and the engineer's points of view.

It would, of course, be impossible at first to include in these specifications every possible type of line and all the available kinds of conductors, but experience would show where amendments and additions were necessary. As a matter of fact he had a manufacturer's list giving 75 sizes of hard-drawn copper wire between 7/0 s.w.g. and No. 11 s.w.g., of which 17 sizes were in more or less constant use, and there were also a number of stranded conductors. Various opinions were held as to when and where stranded wires should be used, and it would be of considerable assistance if some rules could be formulated as to this. There was no need for so many sizes of wire; could not they use Nos. 10, 7, 3, 2, 1/0 and 3/0 s.w.g. wires, which almost corresponded to 0.0125, 0.0255, 0.04, 0.05, 0.06, 0.075, and 0.1 cables respectively? Above this they could use stranded wires of a definite cross-sectional area. This would help manufacturers to stock a quantity of each and so expedite delivery. When he started erecting overhead lines he decided on certain standards, and as far as the e.h.p. lines were concerned, with one or two minor exceptions, he was still erecting to the same standard, a practice which had been of considerable advantage.

Whilst he was convinced of the advantage of standardisation, he was not, however, quite so happy about low-pressure lines. He was a believer in the V-guard type of construction, but only recently had he been able to arrive at what he considered a satisfactory form of construction, although even now he was not sure that it was not capable of improvement.

It was suggested, therefore, that a Committee be appointed to compile a draft specification for submission to a general meeting for discussion and amendment. What he had in mind, said Mr. Redfern, was drawings of all types of poles, together with detailed drawings of the iron work; tables showing maximum sag loading for each size of pole equipped as per drawing; sag tables for each size of wire, and either some form of graph or a table showing the limit of span length which each size of pole would carry and whether the limit was due to pole strength or ground clearance.

Standardisation of the sizes of stay wires and stay blocks could also be included, giving various angles which the stay made with the ground, and suitable for various line angles.

It was admitted that the preparation of such specifications would involve a considerable amount of work, but it was felt that the resultant good to the industry as a whole would justify it.

The author produced a large number of photographs of line construction in connection with his undertaking, of which a few examples are reproduced overleaf.

Discussion.

Mr. A. LENNOX STANTON, in a communication, agreed with the general principle laid down in the paper. He believed, however, that with one or two exceptions the oldest competent contractors for overhead work in this country were intimately bound up with interests whose largest sphere of progressive enterprise was in the underground cable field. Such a procedure was perfectly natural, since the spheres of the cable and the overhead line were intimately connected, and, so far as some classes of work were concerned, were more often than not inseparable. Nevertheless, he suggested that the only possibility of obtaining cheaper overhead construction under happier conditions than at present lay in: (1) Formulating standards of construction which, meeting the requirements of any Government or other regulations in force and accepted by the Electricity Commissioners under a predetermined grading, were capable of application to any type of line required in the country, for, say, a period of fifteen years ahead; (2) Labouring to provide for a co-ordination of all the essential raw- and finished-product interests concerned with the supply, manufacture, and fabrication of all the bulk and accessory detail elements from A to Z, which made up standard overhead lines, to the end that the cost of line-work might be brought within a margin which would not fail to stimulate and encourage development. It was therefore suggested that the Association should obtain detailed evidence of existing types of construction and cost throughout the country, and that an analysis should be made of the information so obtained, showing the trend of construction, its limitations or otherwise, and the relations which a common unit cost might be proved to bear to variables capable of general application.

Mr. W. A. TURNBULL (Aylesbury) said that a thing to guard against was over-standardisation. He suggested that information as to different designs of poles that had been passed by the Electricity Commissioners so far should be collected, and the information so obtained modified in the light of the new regulations. If that information were made available to all the members of the Association it would be of considerable assistance in meeting similar conditions in other parts of the country.

Mr. W. P. GAUVAIN expressed disappointment that the author had not dealt with the question of voltages on the same poles, because no rural scheme of electrification could be a success unless advantage was taken of the existence of high-pressure lines to run low-pressure lines on the same poles

Mr. W. FENNELL (Mid-Cheshire) also emphasised the danger of standardisation in such a manner that it would prevent technical development from time to time. Certainly, in the present stage of overhead work in this country, it would be unwise to go too quickly in the direction of standardisation. Like Mr. Redfern, he had been very much impressed in going about the country with the different methods of construction adopted, and although he was not in favour of a too rigid standardisation, there were undoubtedly directions in which cheaper and more simple construction could be obtained by some degree of standardisation in certain details. He regarded the B.E.S.A. specification for insulators as thoroughly discreditable at the present time. He had adopted it originally, but had to change at a cost of £2,000.

Mr. F. SWARBRICK (Basingstoke) said standardisation could only be regarded from the point of view of arriving at the cheapest possible construction under various conditions. A method of construction suitable in the north would not necessarily suit the conditions in the south. He himself had been considering the possibility of using concrete poles, and was convinced that it was a sound proposition. Within the next few months he would be putting up two miles of line using such poles, and he hoped to let the Association have an account of the working results.

Mr. A. H. ALLEN (ELECTRICAL REVIEW) moved that a Committee be appointed to go into the question of collecting information as to present methods of construction, and to endeavour to arrive at some degree of standardisation.

The PRESIDENT said the Council had given some consideration to this, and perhaps it would meet the position if the meeting instructed the Council to go into the matter. The question of expense would have to be considered.

Mr. KING seconded the motion.

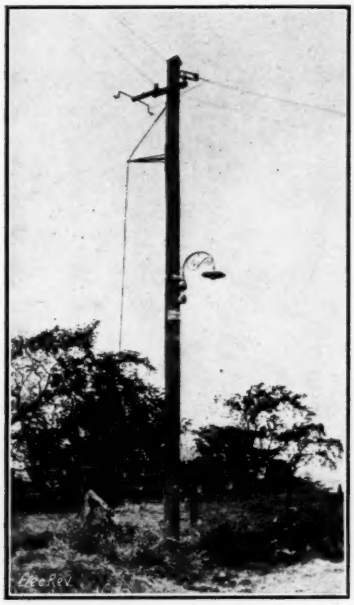
Mr. J. H. C. BROOKING, speaking on the question of expense, said that the manufacturers would stand to benefit most by such an inquiry as was proposed, and although he could not speak for all the manufacturers, his own firm would be prepared to subscribe 10 guineas towards the expense.

The PRESIDENT thanked Mr. Brooking for his generous offer.

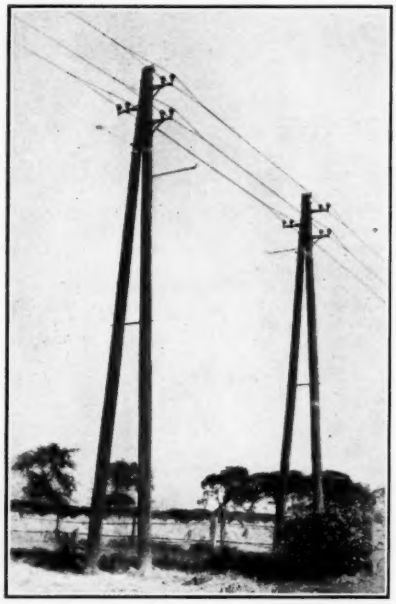
Mr. KING suggested that if it was shown that the Association intended to deal with the matter on really comprehensive lines, they would get the support of most manufacturers.

Eventually, Mr. Allen withdrew his suggestion that a Committee should be formed, on being informed by the President that the Council had already had under consideration the appointment of several committees, including one to deal with this matter.

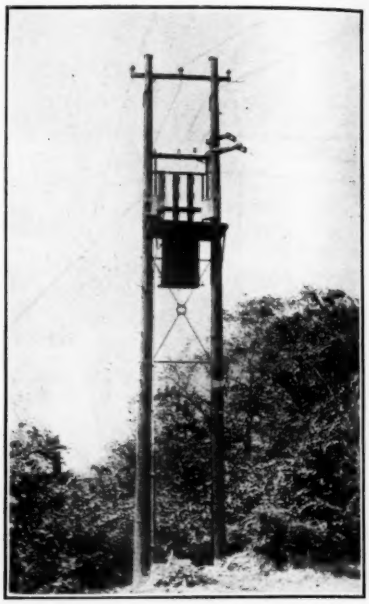
The PRESIDENT, in bringing the meeting to a close, said that the Council was hard at work on wayleave forms. There had been two meetings at which the subject had been discussed, and a large amount of information had been received which was being sorted out in accordance with a request of the Electricity Commissioners. There was a great need for a wayleave form which had a sort of official blessing, and it was hoped within the next month to get out something which would assist the Commissioners in that direction.



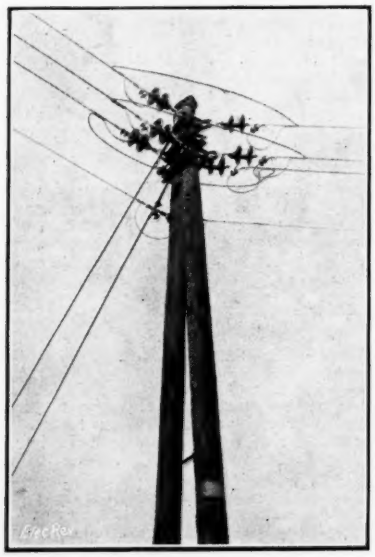
A. Three-wire l.p. line, with street lamp, one wire terminating on pole.



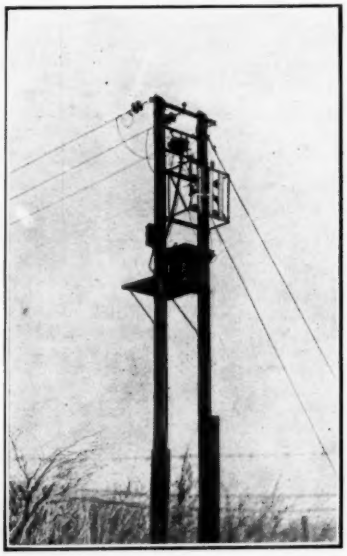
B. Road crossing, heavy pattern; 0.15 sq. in., 11 kV protected by fuses in boxes.



C. Farm transformer pole, 25 kVA, 10,600/400 V; o.h. and u.g. l.p. services



D. Heavy-line pattern, shackle angle pole. 0.15 sq. in., 11 kV.



E. Outdoor sub-station, 25-kVA transformer, 10,600/400 V, on terminal pole, with e.h.p. dividing box.

F. "Lothians" pattern pole steps, cover removed; cover hooks on top step and is padlocked at foot. Ordinary steps above.

Overhead Line Construction, Lothians Electric Power Co.

The Institution of Electrical Engineers.

The Council's Annual Report and Accounts for 1927-28.

MR. A. PAGE, President, occupied the chair at the annual general meeting on May 17th, and announced the following awards of premiums for papers read during the 1927-28 session, or accepted for publication :—

The Institution premium to Mr. F. H. Rosencrants.
Ayrton premium to Mr. F. Lydall.
Fahie premium to Mr. B. S. Cohen.
John Hopkinson premium to Mr. D. B. Hoseason.
Kelvin premium to Messrs. T. N. Riley and T. R. Scott.
Paris premium to Messrs. A. H. Law and J. P. Chittenden.
Extra premiums to Mr. E. C. McKinnon, Mr. H. B. Poynder, Mr. T. H. Turney, Mr. P. D. Morgan.
Wireless premiums to Prof. E. V. Appleton, Lt.-Col. A. G. Lee, Messrs. G. W. N. Cobbold and A. E. Underdown.
Willans premium to Lt.-Col. H. E. O'Brien.

The awards for papers read before Students' Section will be announced later. The president then moved the adoption of the Council's report, which is summarised below :—

The membership is now 13,043, a net increase of 396 for the year; 78 members died during the year. There are at present 3,419 students on the register of the Institution, and a full programme was carried out by the eight Students' Sections.

The Council felt compelled to take steps to stop the use by unauthorised persons of initials implying or likely to give the impression that they are members of the Institution. It took action last December in the Court of Chancery against a non-member, who consented to the granting of a perpetual injunction restraining him from doing so, and also agreed to pay the costs of the action.

During the twelve months, 350 meetings were held in London and the Local Centres by the members, the Council and the various Committees. The attendances and proceedings at the meetings of the Local Centres and Sub-Centres have maintained their high standard. The scheme for the formation of local technical libraries in the provinces has been extended and there are now such libraries at Leeds, Glasgow, Dublin and Newcastle.

The activities of the Wireless Section were satisfactory; eight meetings were held at which 12 papers were read. Eleven informal meetings were held during the session, the average attendance being 75, as against 59 last year.

Through the medium of transatlantic wireless telephony a special joint meeting was held on February 16th, 1928, between over 400 members of the Institution in London and about 1,000 engineers attending the annual conference of the American Institute of Electrical Engineers which was taking place at the same time in New York. The proceedings lasted approximately half an hour, and were made audible to each audience by means of loud-speaking receivers. The reception was strong and very clear both in London and in New York.

The Faraday Lecture this session was delivered by Dr. S. Z. de Ferranti, F.R.S., at London, Cardiff, Dublin, Dundee, Leeds, Liverpool, Manchester, Newcastle-on-Tyne and Sheffield. The nine lectures were attended by a total audience of approximately 5,600, of whom 4,000 were non-members. The latter figure is a satisfactory indication that the lectures are fulfilling their object of bringing electricity to the attention of the public. The summer meeting at the North-Eastern Centre took place in June, 1927. Some 300 members and ladies took part in the meeting, which was most successful.

Continuing the series of reviews of progress in electrical engineering which were published in the *Journal* in 1926 and 1927, reviews on the following subjects have been, or will be, published during 1928 :—

Electrical Measuring Instruments, other than Integrating Meters.
Electrical Standardisation.
Electricity in Mines.
Electro-Chemistry and Electro-Metallurgy.
Integrating Electricity Meters.
Research.

All the 13 sections into which the subject of electrical engineering was originally divided for the purpose of the reviews have now been dealt with and a separate review has also been published on Integrating Electricity Meters. The reviews to be published in 1929 will be on the following subjects :—

Electrical Standardisation.
Power Stations and their Equipment.
Radio-Telegraphy and Radio-Telephony.
Research.
Telegraphy and Telephony.
Transmission and Distribution.

The Council awarded one David Hughes and two Salomons scholarships during the year, each valued at £50 and tenable for one year. It also made three £50 and one £30 grants from the War Thanksgiving Education and Research Fund (No. 1).

In view of the large number of technical organisations and congresses purporting to be international in character, the Council has invited representatives from Associations in the British electrical industry to form a committee to draft conditions which should be complied with in general by an international technical organisation desiring the official support of the Institution. Conditions for this purpose are in preparation by the Committee.

In accordance with a suggestion put forward by the Council, a Conference of Engineering Institutions was held at the Institution of Civil Engineers to consider what action should be taken in connection with the Engineers' Registration Bill which was introduced into the House of Commons last session. The following resolution was passed at the Conference and was duly communicated to the Home Secretary :—"That this Conference unanimously agrees that the Engineers' Registration Bill now before Parliament should be opposed as inimical to the interests of Engineering Institutions and of the public; and that a copy of this resolution be forwarded to the Home Secretary." The Bill was not proceeded with.

In connection with the Architects' Registration Bill, 1928, the Council made representations to a number of members of Parliament with a view to certain amendments being made so as to remove the likelihood of members of the Institution being affected or fettered in any way by its provisions; the Bill did not pass its second reading.

In view of the withdrawal from the Architects' Registration Bill, South Africa, of the clauses purporting to give architects the exclusive right of performing architectural work, it became unnecessary to insert an exempting clause dealing with other professional Institutions whose members might have been affected by the original wording of the Bill.

In January, 1926, a deputation consisting of representatives of the Institution and the Institutions of Civil Engineers, of Mechanical Engineers and of Naval Architects, submitted to the First Lord of the Admiralty a memorandum setting out objections to the changes effected by Fleet Order No. 3241, of November 21st, 1925, which, it was considered, detrimentally affects the status of engineer officers of the Royal Navy. The reply from the First Lord, to the effect that in the view of the Admiralty there are no real grounds for grievance and that experience will convince the engineer officers of the Navy that there is nothing in the Order derogatory to these officers, is not considered to be satisfactory by the Institutions, and they are accordingly considering the matter further.

During the year, 337 books and pamphlets were presented to the reference library and 112 volumes were purchased. The total number of readers for the year was 5,400, of whom 176 were non-members, as against 4,666 and 139 respectively in 1926-1927. During the year, 86 new volumes were added to the lending library and 2,287 books were issued to 982 borrowers, the corresponding numbers for the previous year being 2,401 and 933 respectively.

In 1927 the Joint Standing Committee representing the Board of Education and the Institution was associated with the final examinations of 95 courses at colleges and schools approved in connection with the National Certificates and Diplomas in Electrical Engineering. The final examinations were held during the summer of 1927 and the number of awards was as follows :—333 ordinary certificates; 147 higher certificates (including four post-higher certificates); four ordinary diplomas; and one higher diploma.

A revised edition (ninth) of the Regulations for the Electrical Equipment of Buildings was issued in May, 1927, and a Sub-Committee is at present engaged in considering further revision with a view to simplifying the arrangement of the Regulations.

The Low-Tension Overhead Lines Conference, consisting of the Electricity in Agriculture and Electricity (Supply) Regulations Committees of the Institution and the I.M.E.A. Committee on Low-Tension Overhead Lines, prepared a report which was submitted to the Electricity Commissioners, who subsequently held a conference of all interested parties at which the proposals of the Low-Tension Overhead Lines Conference were taken into consideration, and new Regulations have quite recently been issued by the Commissioners in which many of the proposals put forward have found a place. A conference has also been held with representatives of the Post Office to discuss some of the suggestions made in the report.

The Committee of Management of the Benevolent Fund of the Institution reports that on December 31st, 1927, the capital account of the fund stood at £12,003, and the accumulated income at £1,744. The donations and subscriptions to the fund in 1927 amounted to £1,574, and 87 grants were made to 29 persons, amounting to a total of £1,306.

After making provision for contingencies, the I.E.E. accounts show a balance of £3,675 to the good for 1927 (against £3,881 in 1926); the income was £39,190 (against £38,179 in 1926), and the assets amount to £161,623, which is an improvement of £7,794 on the 1926 figure.

The motion was seconded and, following a request for information about the Council's decision regarding the re-admission of ex-enemy members, the report was adopted unanimously.

Lieut.-Col. F. A. CORTEZ LEIGH, hon. treasurer, then moved the adoption of the accounts, stating that the Tothill Street property had been sold for £25,000, which sum represented a profit; it would be used to discharge the mortgage on the I.E.E. buildings, and the balance would be invested.

The motion having been seconded, a brief discussion took place relative to the desirability of preventing the lapse of student membership which now took place when the time came for transfer to a higher class; the accounts were adopted.

Votes of thanks to the hon. officers of the Institution, both at home and abroad, and the re-appointment of Messrs. Allen Attfield & Co., as auditors, terminated the meeting.

North-West Midlands Electricity District.

Electricity Commissioners' Inquiry at Stoke-on-Trent.

A LOCAL Inquiry into the proposed formation of a Joint Electricity Authority for the North-West Midlands District, as part of the national scheme of electricity supply, was held by the Electricity Commissioners at Stoke-on-Trent on Tuesday, May 15th. The District extends, roughly, from Congleton in the north to Stafford in the south, and from Market Drayton on the west to Uttoxeter on the east.

The "national grid" will run through the District *via* Stafford and Stoke-on-Trent, and on to Crewe, and the places to be connected by secondary transmission lines include Newcastle-under-Lyme, Congleton, Leek, Uttoxeter, Stone, Stafford, and Market Drayton.

The scheme provides that the Joint Authority shall have power to borrow £1,500,000 for the acquisition of generating stations and the development of the transmission system, and it is hoped that the Order will be approved by Parliament this session. A previous Inquiry was reported in the ELECTRICAL REVIEW of February 26th, 1926.

Sir Harry Haward presided over the Inquiry, and was accompanied by Mr. T. P. Wilmshurst.

Sir HARRY HAWARD said the object of the Inquiry was finally to determine the area of the District, and to establish the Joint Electricity Authority. The area was provisionally determined in December, 1924, and in February, 1926, a Local Inquiry was held into the scheme prepared by a conference of authorised undertakers for the formation of a Joint Electricity Authority. The scheme received the general approval of the Electricity Commissioners about October, 1926, and a draft Order was prepared to give effect to it. Then came the Act of 1926, embodying the Government's scheme for the re-organisation of the generation of electricity throughout the country; this important change in the situation necessitated the postponement of proceedings on the draft Order, which remained in abeyance pending the preparation of a scheme for the whole of central England, including the North-West Midlands area. The technical provisions of the Order conformed to and supplemented the lay-out of the primary transmission system provided for the Central England scheme. The present scheme differed but little from the one provisionally approved two years ago, and the Commissioners were assured that it met with the approval of all the authorised undertakers in the District, who were prepared cordially to support and carry it out.

Mr. H. H. BATTLE (secretary, N.W. Midlands Conference Committee) stated that the undertakers were prepared to accept the general principle of the draft Order, subject to representations which had been made to the Electricity Commissioners. Alderman H. LEESE (chairman of the Committee) endorsed this statement.

Sir HARRY HAWARD said he wanted to emphasise the necessity for the development of the rural areas. The Commissioners were anxious that the work should be undertaken in a thorough and comprehensive way.

In answer to the Chairman, Mr. BATTLE said there had not been actual agreement with regard to the terms on which electricity stations would be transferred to the Joint Electricity Authority, but they had agreed on the basis, and it only remained to be worked out.

Explaining the scheme, Mr. ARTHUR ELLIS, expert adviser to the Conference of Authorised Undertakers, said that in his view the Order, in the form in which it was now put forward by the Commissioners, was the only means by which the North-West Midlands District as a whole could be suitably and adequately provided for in respect of the development of electricity supply. The Joint Electricity Authority would, it was contemplated, become responsible, not only for the provision of a system of secondary transmission, but also for the development of supplies from that secondary transmission in the form of local systems of distribution. He was strongly of opinion that the Joint Authority should undertake such distribution rather than that the District should be looked after in that respect by the existing authorised undertakers. Mentioning that in the immediate future Congleton would be making application for an Order to enable it to become the authorised undertaker in the borough, Mr. ELLIS said Congleton was anxious that it should not be involved in the cost of providing a transmission main between Stoke-on-Trent and Congleton, a cost which would be reflected in the charges that Congleton would have to make for its supplies. Under the present scheme the Joint Authority would construct and maintain that transmission line, and the same would apply to the link between Stoke-on-Trent and Leek, and between Leek and Congleton. The various authorised undertakers in the District would take their supplies from the Joint Authority at such prices as the Authority, with the Central Board, adopted in accordance with the Act of 1926, with suitable adjustments. Under the scheme published by the Central Board, the central power house at Stoke-on-Trent would be a selected station. The Stafford Corporation station was not selected, but it would be used during "temporary arrangements." Instead of having a number of authorised undertakers dealing with the Electricity Commissioners or the Central Board, there would be one Authority, which would be working in the interests, not only of the existing and future authorised undertakers in the District, but also of the District as a whole. The amount the Commissioners were being asked to include, as representing the borrowing powers of the Joint Authority, was one which, in his opinion, would provide adequately for the future of distribution. If the scheme were approved, the engineers concerned would immediately make a careful survey. The Stafford Corporation had already given serious consideration to the development of distribution between Stafford and Market Drayton, and had done some work in surveying the area.

The Commissioners then proceeded to deal with details of the scheme.

Mr. H. H. BATTLE said it was suggested by the Conference of Authorised Undertakers that the Leek, Newcastle, and Market Drayton stations be included in the Third Annexe to the scheme, which named the generating stations to be transferred to the Joint Authority.

Sir HARRY HAWARD pointed out that the three stations named were to be shut down within a comparatively short time.

Alderman S. MYOTT, representing Newcastle, said the concern of his Council was to the compensation to be given to undertakings that were closed down. They understood that they would be allowed to continue generating electricity as long as they could do so at as low a price as, or at a lower price than, they could purchase at in bulk.

Sir HARRY HAWARD: Surely you have misapprehended the conditions under which it could be possible for you to be shut down. The conditions are that the supply to be given to you must be below your generating costs, not below the total costs.

After further discussion on the point, the inclusion of the stations named was not pressed. The main technical points of the scheme were then considered. The Order provides for the supply of electricity in bulk to authorised undertakers in the District, that the standard type of current shall be three-phase, at 50 cycles, and that the transmission of electricity in the District shall be at 33,000 volts in the case of main transmission lines, and in the case of secondary transmission lines 11,000 or 6,600 volts.

Mr. ARTHUR ELLIS urged that the Order should provide for a choice of 33,000 or 22,000 volts for transmission lines. From a technical point of view, it had yet to be determined which would be the most advantageous.

Sir HARRY HAWARD intimated that the suggestion would be embodied in the clause.

An important clause in the Order read: "For the purpose of affording supplies of electricity in bulk to authorised undertakers in the District, and to supplement existing or sanctioned interconnecting or bulk supply lines, main or secondary transmission lines shall, subject to any variations subsequently approved by the Commissioners, be established to interconnect: (*a*) Stoke and Leek; (*b*) Stoke and Newcastle-under-Lyme; (*c*) Stoke and Congleton; (*d*) Leek and Congleton; (*e*) Stoke and Market Drayton; (*f*) Uttoxeter and Burton-on-Trent as far as the boundary of the District; and (*g*) Stoke and Stone."

The CHAIRMAN said it seemed to him that the scheme for transmission lines should include a line from Uttoxeter to Leek.

It was agreed to recommend the inclusion of transmission lines from Stoke-on-Trent to Newcastle and Market Drayton, Stafford to Market Drayton, and Stafford to Uttoxeter.

Questioned as to the approximate capital expenditure contemplated by the new Joint Board, Mr. H. H. BATTLE stated that the Conference suggested a million and a half sterling, but there were no definite estimates.

Mr. ELLIS stated that the Stoke-on-Trent power station was to be developed to 40,000 kW, and that might represent an expenditure of from £650,000 to £700,000. The capital outlay on the Stafford station might be £200,000. In addition, there would be the cost of the transmission lines.

At the conclusion of the Inquiry, the CHAIRMAN said he hoped that it would be possible to get the Order finally approved by Parliament this session. It had been intimated to him that Parliament would rise in July, and therefore the Order would have to be made very quickly.

True Daylight.

North sky light, long accepted as the perfect standard of white light for examining colours, has been found to vary in intensity and colour, not only from day to day, but also from hour to hour. The American Institute of Electrical Engineers reports that north sky light is not white, but blue, and the examination of colours under such light exaggerates blues and minimises reds and yellows. It is claimed that noon sunlight and not north sky light should be accepted as the standard, and that artificial white light for colour discrimination purposes should approximate to noon sunlight.—*Science.*

New Electrical Devices, Fittings, and Plant.

Readers are invited to submit particulars of new or improved devices and apparatus for publication in this Section.

A Novel Switch-Fuse.

The accompanying illustrations, figs. 1 and 2, show the "Howsing" switch-fuse which has recently been developed by Messrs. ELECTRICAL UTILITIES, LTD., Tudor Works, Park Royal, N.W.10. The unit acts as a service cut-out and d.p. switch and fuses, all in one, and provides a unique and, it is claimed, efficient piece of apparatus. It has been designed

Fig. 1.—"Howsing" Switch-fuse.

Fig. 2.—Cover Removed, Switch "Off."

with a view to economy and reliability. The cover can be sealed. The switch operates with a quick-make and -break, and the fuses are easily replaceable, as the switch bar can be lifted out while the switch is "off." There is ample terminal accommodation for looping in when required. The base, switch-bar and cover are made of high-grade glazed porcelain.

Automatic Windmill Generators.

An interesting development of Messrs. F. A. WILKINSON AND PARTNERS, LTD., Gretton, near Kettering, Northamptonshire, is the "limited service electric system." This is intended to provide electric lighting in such places as bedrooms, halls, bathrooms, and so on, but not in general living rooms where lighting is required continuously for long periods. Under this

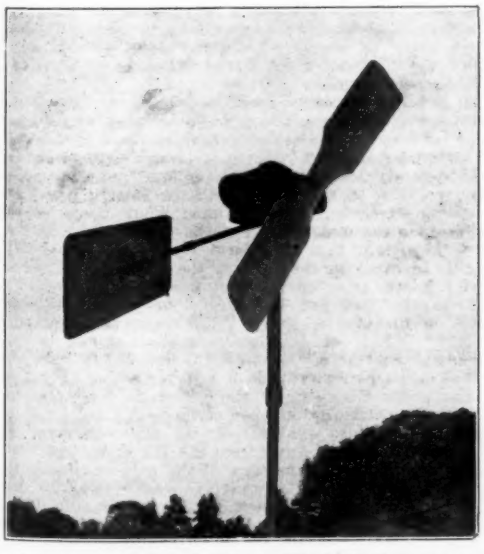


Fig. 3.—"Limited Service" Windmill Generator.

system only a very limited supply of electricity is required, and is provided by means of a small automatic windmill electric generator working in conjunction with a small battery. The windmill generator, fig. 3, is supported by a vertical tube which is either planted in the ground in an open space or mounted upon the roof of the dwelling house in which the switchboard and battery are situated. The installation is automatic in operation, charging being started and stopped according to the velocity of the wind. The machine is claimed to be silent in operation, and it can be easily removed and re-erected.

Decorative Lamp Shades.

We recently visited the showrooms of the BRITISH CENTRAL ELECTRICAL CO., LTD., 6-8, Rosebery Avenue, E.C.1, whose personnel concentrates on the production of painted lamp shades of individual beauty and outstanding originality. Various themes are expressed on skin (real vellum), silk and parchment shades, as well as those of an entirely new material "ambre," resulting in the production of the most ultra-modern conceptions, unconventional in design and colour. It is claimed that two lamp shades are rarely produced exactly alike. One of the most interesting sections of the firm is that devoted to the highly specialised art of converting *objets d'art* into lamps. When a client has his own designs, these are carried out and kept distinctive to him, but the treatment and colouring are usually left to the discretion of the trained designers of the Company. The showrooms have the appearance of a miniature museum; rare rose quartz carvings, unfathomable Chinese idols and solemn-faced Buddhas rest side by side awaiting conversion for their more practical applications. It is the proud boast of the firm that it produces one of the most varied and distinctive ranges of lamp shades in the country, appealing alike to the connoisseur and the man and woman of cultured tastes.

A New Earthing Adaptor.

In view of the existing regulations for electrical installations, specifying that all electrical appliances should be earthed, Messrs. I. CALVETE, LTD., 11, Little Saint Andrew Street, Charing Cross Road, W.C.2, have devised an adaptor specially for the purpose. This is provided with an extra terminal which, when the adaptor is inserted in a standard bayonet-cap lampholder, automatically forms an earth connection, provided the holder is properly earthed. A three-wire flex would, of course, be necessary in the place of the usual twin wire. The earthing terminal is accommodated inside the cap so as to afford no unsightly exterior connection. It is claimed that the earth connection is to be relied upon, even in cases of a faulty plunger-spring developing in the lampholder. The actual earth connection on the adaptor is apparently made by the cross pin. The adaptor is made of bakelite and substantially built. It is specially suitable for electric irons, kettles, and all domestic apparatus.

A Miniature Hydro-electric Set.

To provide a means for emergency lighting in hotels, schools, theatres, and other public buildings, the Utilities Service, Inc., Troy, Pa., has developed a hydro-electric unit that is operated from the building water system. This unit, some particulars

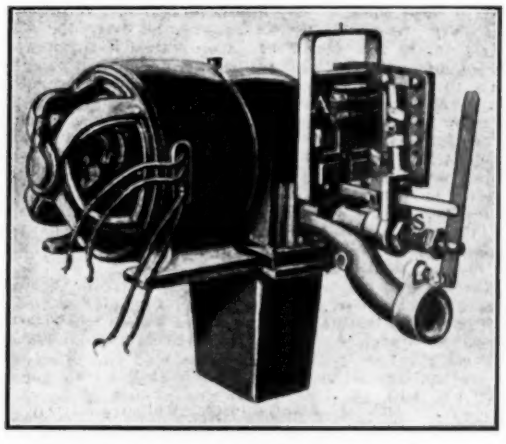


Fig. 4.—Small Water-driven Generator.

of which are given in *Power*, is essentially an automatic-starting miniature hydro-electric plant consisting of a d.c. generator having a waterwheel runner carried on its extended shaft, the complete equipment forming a compact self-contained unit, fig. 4. The automatic starting apparatus consists of a needle nozzle which is manually closed against a spring s and held

in that position by a latch. A solenoid A, which is connected across the line of the outside source of power, is arranged so that when it is de-energised, owing to failure of the outside supply, it will operate a switch for transferring the lighting circuit to the local generator. It is a special compound-wound machine and gives approximately constant voltage from no-load and runaway speed to full-load and normal speed. The waterwheel is of the impulse type. Tests conducted on a 1,500-watt unit indicated an over-all efficiency of 64 per cent. from water delivered to the nozzle to electrical power in the lamp circuit.

Riverside Power Station, Shanghai.

Further Extensions to the most Important Power Station in China.

WE have from time to time described extensions of plant and mains which have been carried out by the Municipal Electricity Department of Shanghai; for the following notes regarding the latest extensions, which are now in progress, we are indebted to the engineer-in-chief and manager, Mr. T. H. U. Aldridge, M.I.E.E., M.I.Mech.E., Fel.Amer.I.E.E. :—

The installed plant capacity of the Riverside Power Station (in commission) is 121,000 kW. Early in 1926 it became evident that in order to meet the increasing demands, further extensions to the station, together with transmission and distribution plant, would have to be provided, and the following programme was accepted by the Electricity Committee and approved by the Council: The installation of a 20,000-kW (maximum continuous rating) turbo-alternator, to be ordered in 1926, and another set of the same capacity to be ordered in 1927; three boilers, each having a normal evaporation of 140,000 lb. of water per hour, with a continuous maximum output of 180,000 lb., to be ordered in 1926, and the fourth, of similar size, to be ordered in 1927. The 22-kV main switchgear for the control of the two alternators and several new 22-kV trunk feeders, and step-up transformers, were also to be provided.

The "Lopulco" system of firing the boilers has been selected, each boiler having its complete pulverising unit and storage bin for the powdered fuel; provision is made by means of screw conveyors to supply the burners of adjacent boilers from neighbouring bins in the event of a pulverising mill breaking down or otherwise being out of commission. An integral Babcock & Wilcox economiser is fitted to each boiler, and the boilers are also equipped with air preheaters. Although in the section of the station which contains the 121,000 kW of plant the steam pressure is 200 lb. per sq. in., with a final steam temperature of 572 deg. F., it was decided to take advantage of the higher efficiency and improved economy of higher steam pressures and temperatures. The benefits to be derived from this decision were considered amply to justify the use of two pressures in the same station, particularly having in mind the high system load factor of the Shanghai undertaking (60 per cent.), and the further decision to operate this new 40,000-kW section of the station as a base load plant. A boiler pressure of 375 lb. per sq. in. and final steam temperature of 700 deg. F., with a pressure at the turbine stop valve of 350 lb., was adopted. By means of reducing valves in the main steam range, steam can be supplied from the 375-lb. boiler plant to the older 200-lb. main range if required, but it is not intended to operate the station under such conditions except in emergency, the underlying idea being to operate the new section, as regards steam supply, as a separate unit.

The first turbine, now being erected at Shanghai, is arranged for bleeding at two stages, raising the temperature of the condensate for boiler feed purposes to 200 deg. F. The second turbine, now being built, is arranged for three-stage bleeding to give a temperature to the condensate of 245 deg. F. Both turbines are of the two-cylinder or tandem design, running at 3,000 r.p.m. The turbines are designed for a maximum continuous rating of 20,000 kW (25,000 kVA), with the highest efficiency at 16,000-18,000 kW.

Experience in the existing station has shown that large boiler units are more satisfactory than a greater number of small ones. In this new extension two boilers per 20,000-kW turbine are provided. When this section is running as a base-load plant, with three boilers on load and one laid off for overhaul, sufficient steam will be available to generate 40,000 kW with the boilers operating at best efficiency (87½ per cent). In the event of one boiler having to be taken off load there will be still sufficient steam available for 36,000 kW by pushing the rating of the two remaining boilers up to 180,000 lb. per hour each, but at a somewhat reduced boiler efficiency.

Two of the boilers, complete with economisers and air heaters, are of the Babcock & Wilcox cross-drum marine type, steel cased. The third boiler is a Stirling, with a similar economiser and air heater. The fourth boiler unit (Stirling), now being built, will be equipped with a Howden-Ljungström air heater.

The combustion chambers of the boilers are lined with Murray fin water tubes. The pulverising equipment for the first three boilers has been provided with driers for drying the raw coal before it enters the mills. In connection with the firing equipment for the fourth boiler, however, driers have been omitted, as it is believed that the moisture content of the various coals used is sufficiently low to render the driers unnecessary, but provision is made in the layout for the drying apparatus to be added later if it is found necessary.

The following firms are responsible for the various works :—

Turbo-alternators: The Metropolitan-Vickers Electrical Export Co., Ltd.

Boilers (two B. & W. marine): Babcock & Wilcox, Ltd.

Boilers (two Stirling): Stirling Boiler Co., Ltd.

Air Heater for Fourth Boiler: Howden-Ljungström Preheaters (Land), Ltd.

Main 22-kV Switchgear: British Thomson-Houston Co., Ltd.

Auxiliary 6.6 kV and L.P. A.C. Switchgear: Ferguson, Pailin, Ltd.

Auxiliary D.C. Switchgear: English Electric Co., Ltd.

Auxiliary A.C. Ironclad Fuse Gear: A. Reyrolle & Co., Ltd.

Steam Feed Pump: G. & J. Weir, Ltd.

Electric Feed Pumps: Holden & Brooke, Ltd.

Steelwork for Boiler House and Turbine Room, and Steam and Water Piping: Babcock & Wilcox, Ltd.

H.P. Steam Valves, Electrically Controlled and Manually Operated: Hopkinsons, Ltd.

Condenser Water Circulating Pumps: W. H. Allen, Sons and Co., Ltd.

Step-up Transformers, 6,600/22,000 V: International General Electric Co., N.Y.

In the (1920) No. 3 Boiler House, which contains five Babcock & Wilcox and five Stirling boilers, each of which has a normal evaporation of 80,000 lb. per hour, but which have at times been run up to 114,000 lb. per hour, two of the boilers have been equipped with Howden-Ljungström air heaters. The boiler efficiency of these two boilers under month-to-month running conditions has been raised from 79 per cent. to 85 per cent. The improvement which these air heaters have brought about has led to the decision to equip the remaining eight boilers with air heaters, two of which are going in this year. So far no serious deterioration of the fire-brick furnace lining, or of the tuyeres of the Erith-Riley stokers, has been observed. The temperature of the inlet air to the furnace is from 280 deg. to 290 deg. F.

Correspondence.

***Correspondents should forward their communications* as early as possible.** *No letter can be published unless we have the writer's name and address in our possession.*

Trade Union Interference.

The above heading, which appeared over an article criticising the action of the No. 3 (North-Western) District Joint Board in your last week's issue, is misleading; in fact, the whole article conveys a wrong impression of the facts.

The Ashton-under-Lyne Corporation for many years has been a party to the No. 3 District Joint Board, and has adopted the National Joint Board Schedule of Salaries and Conditions of Service.

That Schedule contains a clause (39) which gives the District Joint Board jurisdiction to determine any difference arising between an undertaker and an employé touching "the interpretation of or otherwise in relation to these conditions or the application thereof to any employé," and the Schedule further provides that the decision of the District Joint Board, or, failing agreement, the National Joint Board, shall be binding upon the undertaker and the employé.

It is important that the above facts should be kept prominently in mind, as they govern the whole procedure of the District Boards and the National Board.

It was therefore not an act of "unwarrantable interference" on the part of the E.P.E.A., nor did it amount to a request "that the Ashton Corporation should hand over the general control of its staff to the D.J.B.," when the E.P.E.A. brought forward, as it was perfectly entitled to do, a claim under Clause 39 of the Schedule in relation to the grading of a particular member of the staff.

The D.J.B. heard evidence on the claim in great detail, both from the employer and from the E.P.E.A., and although questions as to the competency of the man in question were raised, the chairman ruled that the matter must be decided not in relation to the competency of the man in question, but in relation to the duties and responsibilities carreid out by him.

The D.J.B. acted according to the chairman's ruling, and decided that the claim had been established. The following is the decision :—

"That this Board, having heard evidence of the duties and responsibilities devolving upon the assistant mains engineer at Ashton-under-Lyne, which evidence is confirmed by the chief engineer, is of opinion that the claim has in this particular case been established."

The author has not read the minutes of the Board with sufficient care, otherwise he would have had no difficulty as "an unbiased person" in understanding the finding of the Board.

Generally the author appears to be concerned as to where the "average town councillor" is permitting himself to be led to, and as to the constitution of the Employers' Sides of the Boards.

The "average town councillor" in the North-Western Area is fully conscious of the extent to which the powers have been granted to the District Board, and, in fact, at every annual conference a detailed report upon the activities of the Board is printed in advance and fully discussed at the meeting which elects representatives.

I suggest that the author might leave the North-Western constituent undertakers to settle their own affairs and continue to deal with their business in the manner which best suits them. On the other hand, if he will reveal his identity I will deal more fully with the question which he has raised upon a mistaken or incomplete knowledge of the facts.

C. Higham,
Chairman No. 3 District Joint Board.

Manchester, *May 21st*, 1928.

[A letter to similar effect has been received from the general secretary of the Electrical Power Engineers' Association; unfortunately space is not available for its insertion.—EDS. ELEC. REV.]

Cheaper Electricity Promotes Greater Demand.

With reference to my letter in last week's issue of the ELECTRICAL REVIEW under the above title, the opinion expressed was my personal one, and should not be associated with the name of the Times Electric Co., Ltd. I shall be glad if you will be good enough to make this correction.

F. Goble.

London, *May 19th*, 1928.

The Danger of a Little Knowledge.

A somewhat amusing incident occurred at the recent removal of a shop which was supplied with electricity in the residential area of a large city.

The owner did not think it worth while to notify the authority that he had finished with the supply and wished the service disconnected, but proceeded to attend to the matter himself.

Evidently treating electricity as a fluid or gas, he took a hammer and flattened the lead-covered armoured cable to prevent the electricity from escaping, as he had just finished doing to the water supply.

The consequences, of course, were serious—not to himself, but to the cable and consumers in the area affected, to say nothing of an all-night job for the mains engineer, who is always so pleased to spend the hours when he should be asleep in looking for the result of such unfortunate mistakes.

Earth.

May 14th, 1928.

Lead-sheathed Cables Attacked by Rats.

With reference to a letter in your issue of May 11th under the above title, I am enclosing a sample which has recently been recovered from this station.

The cable was one of 16 which were laid in wooden troughing some three years ago. No fault was apparent, and the cables on being recovered (for other reasons) were found to run quite close to a rat's nest.

I understand that P.O. engineers have in several cases encountered the same difficulty, and I believe that the cables in the new War Office, when first laid, were also attacked by these pests.

R. S. Phillips.

P.O. Research Station, Dollis Hill, *May 18th*, 1928.

[The sample is part of a single-core rubber-insulated lead-sheathed cable, about 7/16 s.w.g. The sheath has been gnawed over a length of six inches, exposing the rubber for four inches and the conductor itself, which is badly corroded, for one inch.—EDS. ELEC. REV.]

Wood as an Insulator.

I was much interested by the letter from "E.M." in the current issue of the ELECTRICAL REVIEW on "Wood as an Insulator." Teak is such a valuable wood from the point of view of the instrument maker that any data in connection with it are bound to be of interest.

I do not think that the coats of shellac mentioned need be taken into consideration, unless there is any reason to suspect the presence of an undue amount of acid in the varnish. I have traced insulation defects to a shellac solution in methylated spirit which was so acid that it corroded the joints it was supposed to protect. Leaving this out of the question, as the nails or screws were inserted into the body of the wood, it would appear that the wide variations of resistance mentioned were due to some internal conditions. It would be interesting to know the spacing of the nails or screws, their position as to grain, and if it was an old, well-seasoned piece of wood.

If "E.M." cares to communicate with me through the ELECTRICAL REVIEW, I may be able to fix up some other tests at even higher pressures.

L. Rutledge.

London, *May 19th*, 1928.

Single-pole Fuseboards.

Although the writer is loath to reply to anyone who hides behind a *nom de plume*, I cannot let the remarks of "Electron" and "Happy to Assist" pass without comment.

I would again state that (in my opinion) the questions raised by "Electron" in a technical journal were strange ones, in view of the standardisation in existence all over Britain, presuming, of course, that your correspondent is an electrical engineer.

I would point out to "Happy to Assist" that it was not my intention to throw mud at any particular person, and surely your correspondent does not expect me to apologise for being sincere and stating facts.

"Electron" asks me to read the rules of the I.E.E. If I had not been acquainted with the rules, and particularly those relating to d.p. switch and fusegear, I would not have entered into this correspondence.

Mr. Rawll was indeed exceedingly generous in giving his views, and I am glad if both your correspondents are sincere in the value they place upon Mr. Rawll's advice.

A. Milne.

Glasgow, *May 19th*, 1928.

The Domestic Load in Toronto.

The following extract from the *Electrical World* of May 12th is more expressive than any words of mine could be:—

"ONTARIO HYDRO RATES RAISED AT TORONTO."

"About eighty-six thousand users of electricity in Toronto have been called upon to pay more for their power and light by reason of an upward adjustment of rates announced by the Hydro-Electric Power Commission of Ontario. . . ."

"The minimum rate is now 1¼ cents per kilowatt-hour, with 10 per cent. discount for prompt payment, compared with 1 cent per kilowatt-hour, with the same discount, the rate which prevailed for some years. . . ."

"The announcement intimates that the revision upwards has been necessary because domestic consumption has passed beyond the limits of off-peak supply."

Fredk. W. Purse,
Engineer and Manager.

West Ham Electricity Department, *May 19th*, 1928.

Parliamentary News.

[By Our Special Parliamentary Reporter.]

Underground v. Overhead Transmission.

On May 14th Mr. TREVELYAN asked the Minister of Transport if he could give any estimate of the increased cost of putting electric lines underground through small country towns as compared with carrying the lines overhead.

Colonel ASHLEY said that the cost of underground lines depended on a number of varying factors. For the various classes of lines likely to be used in the development of electricity supply in country towns, the cost of underground construction might represent an increase of from 150 to 200 per cent., or even more, on the cost of overhead construction, according to the particular conditions.

The Wireless and Cable Conference.

On May 14th, Mr. BALDWIN informed Mr. W. BAKER that it was not possible to forecast when the report of the Imperial Wireless and Cable Conference would be available. He understood that the deliberations of the Conference would not be concluded for some little time. As soon as he was in a position to do so he would make a statement.

The Bergius System.

On May 14th, Mr. HARDIE asked the Secretary for Mines what was the cost of treating one cwt. or one ton of coal by the Bergius system of extracting oil from coal.

Commodore KING said that the Bergius process was still in the experimental stage, and no plant of a commercial size was in existence in this country, so that it was impossible to give even a rough estimate of the cost of the process. Much more work was required on the details before the cost of working, or the conditions giving the lowest cost of working, could be stated.

Mr. HARDIE inquired what amount of coal was used in treating one ton of coal on the Bergius system.

Commodore KING said that the coal consumed in hydrogenating one ton of coal might be divided into three parts—that used for power, that for heating, and that for manufacturing hydrogen. As power, heat and hydrogen could all be obtained by hydro-electric energy, it was possible that in some circumstances the answer might be "none." If, however, coal was used for all those purposes, then the answer depended on how the process was organised. Dr. Bergius had shown how hydrogen might be obtained from the gas evolved in the process, and if that were done he estimated that 8 cwt. of coal would be required for treating one ton of coal, in an efficient large scale plant.

On May 17th, Commodore KING informed Mr. WHITELEY that experiments on a laboratory scale were carried out at the Fuel Research Station, Greenwich, from 1923 to 1926, and since that year on a small technical scale. The cost to date was approximately £10,000. Special experiments were carried out for the Department of Scientific and Industrial Research by Dr. Bergius in Germany from February, 1926, to April, 1927. The cost of those experiments was £15,533. Experiments on a small scale had also been carried out at Birmingham University. The subject was being studied exhaustively by at least one commercial undertaking.

In reply to a question by Mr. OLIVER, Commodore KING said there were at least eleven different systems of low temperature carbonisation represented in this country by plants, either in existence or stated to be in course of erection, with a capacity of from 10 to 250 tons a day.

Electricity Charges.

On May 15th, Mr. DAY asked the Minister of Transport whether he would give particulars of the number of applications which had been made by any of the local authorities asking for the revision of the maximum prices which might be charged for electricity in their boroughs; and what action he had taken.

Colonel ASHLEY replied that the general provisions under which applications could be made to him for a revision of the maximum prices charged for electricity were contained in the Electricity (Supply) Act, 1922. Since the passing of that Act, 21 such applications, affecting 19 undertakings, or parts of undertakings, had been made by local authorities. In 13 of those cases he had made Orders fixing reduced maximum prices; in five cases applications were in abeyance pending local negotiations with a view to settlement, and in the remaining case an inquiry was pending.

Public Roads and Services.

On May 17th, in the House of Lords, Lord MONTAGU OF BEAULIEU moved: "That in the opinion of this House, the time has come when the whole question of the rights of undertakers to dig up public roads for water, drains, gas, electricity and similar services, and to use such wayleaves free of charge should be reconsidered." He pointed out that the tearing up of streets and roads when traffic, especially in the large cities, had become very heavy was a serious matter. When the undertakers received their powers under an Act of 1847, the roads were of simple construction, but to-day many of them were massive engineering structures. He suggested that the Act of 1847 should be amended with regard to gas works and water works, that the special provisions of the London Traffic Act dealing with road disturbances should be extended to the country generally, and that the period of non-disturbance of the important highways laid down in that Act should be extended from one year to two years. In all new roads, the undertakers should duplicate the essential services by laying them on each side of the road, and, where demanded by the highway authority, existing services should be duplicated within a period of, say, five years. In the bigger streets, such as Piccadilly, Oxford Street, and Regent Street, the construction of subways or tunnels for the accommodation of the essential services should be begun as soon as possible. Also, the undertakers should be charged for the use of the tunnels.

Lord ONSLOW, replying for the Government, said that the matter was being considered very carefully, and certain steps had already been taken on the lines indicated by Lord Montagu. The Minister of Transport would give favourable consideration to the reforms which had been suggested.

The motion was withdrawn

Private Bills.

The London County Council Bill providing powers to reconstruct the Embankment-Kingsway subway, &c., has been passed for third reading by the Unopposed Bills Committee of the House of Lords.

The Local Legislation Committee of the House of Commons has passed a proposal contained in the Rotherham Corporation Bill to run trolley vehicles and link up the system with that of the Mexborough and Swinton Tramways Co.

Cable-Wireless Debate.

On May 21st, on the formal motion for the adjournment, Mr. W. BAKER opened a debate upon a number of questions connected with the cable and wireless services. Sir J. GILMOUR replied for the Government.

Legal.

Leicestershire and Warwickshire Electric Power Co. v. Electricity Commissioners and the Ministry of Transport.

ON May 17th the Leicestershire and Warwickshire Electric Power Co. applied for a writ of *certiorari* against the Electricity Commissioners and the Ministry of Transport in a King's Bench Divisional Court consisting of Mr. Justice Acton and Mr. Justice Finlay. The company sought a rule, addressed to the Ministry of Transport, in whose custody was a Special Order made on December 16th last by the Electricity Commissioners entitled the Polesworth and District Electricity Special Order, calling upon the Minister to bring up the Order for a part of it to be quashed.

For the applicants, Mr. FREDERICK WALLACE said that in this case the Commissioners had made an Order in favour of the Pooley Hall Colliery Co., and by Section 12 of that Order they purported to revoke certain powers granted to the Electric Power Co. by another Special Order called the Atherstone Order of 1922, which gave the applicants powers for lighting and all other purposes within their statutory area. By notice in the *London Gazette* of December 16th the Minister of Transport announced that he proposed to confirm the new Order, which said that so much of the Atherstone and District Special Order of 1922 as related to certain districts "shall be and is hereby revoked." Mr. Bryden, the appellants' secretary, had made an affidavit saying that the rights and interests of his company were prejudiced by the Polesworth Order, which, it was submitted, was invalid. Because of the competition between the Polesworth Order and the Atherstone Order an inquiry was held last year. The Power Company had lodged an objection to the intention of the Ministry expressed in the *Gazette*. The Order must be *ultra vires* because the Electricity Commissioners could not revoke by Special Order an existing Special Order; only Parliament could do that. Specific power had been granted to revoke a Provisional Order, but the Section abstained from saying that a Special Order might revoke a Special Order.

Mr. Justice ACTON asked if the applicants could not achieve their object by memorialising the Minister of Transport.

Mr. WALLACE answered that he hardly thought so. Such a point was taken in a case in 1924—that an application for a rule *certiorari* was premature because there was still an appeal to the Ministry of Transport and still an appeal to the House of Commons, but that argument was definitely rejected in that case, and it was said that if an invalidity had been effected no time was too soon to apply for the removal of it. The present case was stronger than that because an Order had been made.

Mr. Justice ACTON: You say the Electricity Commissioners cannot sweep away that which has not only been the subject-matter of an Order by them, but has been confirmed by the Ministry of Transport and approved by both Houses of Parliament.

Mr. WALLACE said that the Minister of Transport had certain powers to revoke Orders given, but under Section 26 the Electricity Commissioners, he said, had not the powers they purported to exercise. The Electricity Commissioners had no right to make an invalid Order and pass it on for confirmation to the Ministry; nine out of ten such cases would pass as presented.

Mr. Justice ACTON said the rule *certiorari* would be granted as asked for, addressed to the Minister of Transport, to bring up the Order to be reviewed and part quashed, and notice would also be given to the Electricity Commissioners and the Pooley Hall Colliery Co.

Automatic Telephone Patents.

MR. JUSTICE TOMLIN, in the Chancery Division on May 18th, had before him the petition of the AUTOMATIC TELEPHONE MANUFACTURING CO., LTD., for an extension of the life of four letters patent relating to improvements in automatic telephone systems by five years, on the ground that the war had prevented the petitioners from obtaining the full benefit of working them.

The petition was opposed by COVENTRY AUTOMATIC TELEPHONES, LTD., on the ground that the petitioners had been adequately remunerated and had suffered no loss or damage because of the war.

For the petitioners, Mr. WHITEHEAD, K.C., explained that the invention, which was the subject of letters patent, enabled a subscriber by means of a dial to effect for himself automatic telephonic connection with another subscriber. The petitioning company was registered in 1912 and acquired for £240,000 from the Automatic Electrical Co. of Chicago seventeen patents, with the right to further improvements and inventions. Extensions of some of these patents had already been granted. From 1912 until the outbreak of the war large sums were spent in bringing the invention to fruition, and in exploiting it in this country. Practically speaking, the war put an end to the company's activities, and for several years afterwards the General Post Office, which was the company's biggest potential customer, was not in a position to adopt the automatic system because of the serious disorganisation of its skilled staff during the wear. The result was that in 1923 there was no really substantial user of the invention in this country. The Coventry Company alleged that the petitioners

had benefited by the delay caused by the war, but the answer to that was that the Post Office trials prior to the war had proved to their (the Post Office) satisfaction that the system was a successful one. In fact, in July, 1912, the G.P.O. decided to adopt the system and an order for an installation at Leeds was actually given.

Sir WILLIAM SLINGO, formerly Chief Engineer to the G.P.O., said that in 1912, after various trials, he concluded that the system was satisfactory, and he gave orders for installations. The primary reasons for not placing substantial orders with the company was the war, and not because of the desire of the G.P.O. for standardisation, which could not have been brought about without long experience, as it involved the merger of different systems and the pooling of patents.

For the opposition, Mr. BERNARD ANSON was called. He is head of the G.P.O. automatic telephone training school and was for 19 years in the Engineering Department. He said that in 1912 nobody was in a position to form an opinion as to what was the best automatic telephone system. The tests had been made in small towns only, and the Leeds order was in the nature of an experiment. But the G.P.O. now had sufficient information to know that automatic telephony would be suitable for large centres of population.

The hearing was adjourned until the following day, when after hearing Mr. R. Moritz, K.C., for the opponents, his LORDSHIP held that the war had affected detrimentally the development of the applicants' invention and granted an extension of the patents to January, 1931.

Application for Compulsory Marconi Licences.

THE Loewe Radio Co., Ltd., states that it has filed an application for compulsory licences under certain patents held by the Marconi Company. The hearing has been fixed for June 26th.

Published Specifications.

Compiled expressly for this journal by a firm of Chartered Patent Agents. The numbers in parentheses are those under which the specifications will be printed and abridged and all subsequent proceedings taken.

1926.

26,586. "Mountings for receivers and transmitting devices for use with telephones and the like." D. S. S. Stewart. October 25th, 1926. (289,339.)

29,106. "Method and apparatus for absorbing non-precious gases in manufacturing electric discharge tubes." E. Schrack and Dr. R. Ettenreich (trading as Radiowerke E. Schrack). June 17th, 1926. (272,843.)

1927.

1,863. "Thermionic valve apparatus." Edison Swan Electric Co., Ltd., and T. F. Stent. January 21st, 1927. (289,506.)

1,968. "Apparatus for treatment by means of ultra-violet rays." C. A. Cooper. January 22nd, 1927. (289,508)

2,006. "Electron-emitting cathodes, and the methods of manufacture thereof." J. R. Sinclair. January 24th, 1927. (289,509.)

2,157. "Electric starting-mechanism for internal-combustion engines." British Thomson Houston Co., Ltd., J. Hutt and E. G. Parrott. January 25th, 1927. (289,514.)

2,258. "Electric protective systems." A. Reyrolle & Co., Ltd., R. W. Biles and E. W. M. Scott. January 26th, 1927. (289,520.)

2,326. "Radio broadcasting systems." Standard Telephones & Cables, Ltd. (Western Electric Co., Inc.). January 26th, 1927. (289,524.)

2,389. "Mechanism for operating electrical contacts and other devices." E. F. Moy, Ltd., and A. S. Newman. January 27th, 1927. (289,527.)

2,433. "Means for supplying direct current of predetermined voltages from a supply main." British Thomson-Houston Co., Ltd., R. C. Clinker and T. Wadsworth. January 27th, 1927. (289,530.)

2,439. "Telephone systems." Automatic Telephone Manufacturing Co., Ltd., W. O. Passmore and C. E. Beale. January 27th, 1927. (289,532.)

2,511. "Railway signalling systems of the track-circuit type." L. H. Peter and Westinghouse Brake & Saxby Signal Co., Ltd. January 28th, 1927. (289,536.)

2,512. "Alternating current signalling systems for railways and the like." L. H. Peter and Westinghouse Brake & Saxby Signal Co., Ltd. January 28th, 1927. (289,537.)

2,513. "Leakage indicators for alternating-current circuits." L. H. Peter and Westinghouse Brake & Saxby Signal Co., Ltd. January 28th, 1927. (289,538.)

2,540. "Electric time switching devices." C. Rose. January 28th, 1927. (289,540.)

2,564 "Electromagnetic relays." Standard Telephones & Cables, Ltd. (Western Electric Co., Inc.). January 28th, 1927. (289,543.)

2,591. "Electric heating appliances." C. B. Backer. January 28th, 1927. (289,545.)

2,592. "Electrically-heated flat-irons." C. B. Backer. January 28th, 1927. (289,546.)

2,910. "Railway signalling apparatus." L. H. Peter and Westinghouse Brake & Saxby Signal Co., Ltd. February 1st, 1927. (289,563.)

2,982. "Thermionic valve coupling-devices." G. E. A. Pohu. February 2nd, 1927. (289,566.)

2,985. "Adjustable automatic switch for electric lighting." J. B. Bignamy. February 2nd, 1927. (289,567.)

3,008. "Systems for the generation and storage of electricity." W. J. Rickets. February 2nd, 1927. (289,568.)

3,464. "Magneto-electric machines." J. Lucas, Ltd., and E. O. Turner. February 7th, 1927. (289,573.)

3,561. "Devices for generating ultra-violet rays and activating oxygen and other substances." Dr. H. Geffcken and Dr. H. Richter. February 8th, 1926. (265,636.)

4,138. "Film-feeding devices for use in talking motion picture recording and reproducing apparatus." De Forest Phonofilms, Ltd. April 10th, 1926. (269,140.)

4,396. "Means for supporting electrodes in boilers." J. G. Barber February 16th, 1927. (289,586.)

6,799. "Electromechanical devices for the production of alternating or pulsating currents." Coventry Automatic Telephones, Ltd., and J. E. Collyer. March 11th, 1927. (289,602.)

6,987. "Electric signalling systems." Siemens & Halske Akt. Ges. March 13th, 1926. (267,556.)

7,064. "Releasing mechanism for prepayment meters." Allgemeine Elektricitäts Ges. March 19th, 1926. (267,926.)

7,349. "Direct-current electric generators." F. Newton. March 16th, 1927. (289,604.)

7,791. "Loud speaker." Hopkins Corporation. March 23rd, 1926. (268,338.)

8,466. "Electric discharge devices." Raytheon Manufacturing Co. May 24th, 1926. (271,419.)

9,566. "Electric lampholders." G. W. Hawker. April 7th, 1927. (289,620.)

9,963. "Sound-amplifying instruments." B. Munn. April 11th, 1927. (289,624.)

10,252. "Tools for stripping insulation from electric wires." W. Selley. April 14th, 1927. (289,626.)

11,594. "Method of joining the ends of high-tension electric cables, and an improved junction-box therefor." Naamlooze Vennootschap Nederlandsche Kabelfabriek. March 29th, 1927. (287,887.)

13,064. "Electric lamp pendants." A. A. Govan May 16th, 1927. (289,662.)

13,098. "Electric connectors." J. B. Taunton. May 16th, 1927. (289,645.)

13,643. "Fire-alarm and like installations." Siemens & Halske Akt. Ges. May 17th, 1927. (289,649.)

15,578. "Automatic telephone apparatus." A. Ducker. June 9th, 1927. (289,662.)

15,632. "High-speed telegraphy." Etablissements E. Belin and E. Belin. June 11th, 1927. (Addition to 272,250.) (289,663.)

16,108. "Lighting of multi-floor buildings." J. Rings. June 21st, 1926. (272,944.)

19,059. "Electric conductors for electric machines." Limited Co. (formerly Skoda Works, Pilzen). July 16th, 1926. (274,510.)

19,907. "Carbons for electrotechnical uses and process of manufacture thereof." M. Oswald. July 27th, 1927. (289,680.)

21,782. "Gas-tight seals for conductors for vacuum tubes and other electric devices." British Thomson-Houston Co., Ltd. August 23rd, 1926. (Addition to 179,779.) (276,345.)

22,363. "Acoustic sounding apparatus." A. Behm. August 28th, 1926. (276,680.)

22,798. "Protecting coating for covered conductors, and method of applying the same." Wiremold Co. March 22nd, 1927. (287,496.)

23,232. "Electric water-heaters primarily intended for use in making coffee." M. Brandt and R. Naujoks. September 5th, 1927. (289,689.)

23,435. "Copper disk rectifiers for alternating current." Siemens-Schuckertwerke Akt. Ges. September 11th, 1926. (277,337.)

23,534. "Devices for the selective protection of high-tension transformers." Akt. Ges. Brown, Boveri et Cie. September 8th, 1926. (277,343.)

25,494. "Circuit interrupters and operating mechanism therefor." Metropolitan-Vickers Electrical Co., Ltd. September 28th, 1926. (278,360.)

25,750. "Bow collectors for overhead wire systems of electric traction." Brecknell, Munro & Rogers, Ltd., and A. M. Willis. September 29th, 1927. (289,704.)

25,837. "Outdoor electric switches or cut-offs." A. G. Johnsen. September 30th, 1927. (289,705.)

25,904. "Electrically-driven wood-grinding and like apparatus." X. Winkler and E. Holtzmann & Cie. Akt. Ges. September 30th, 1927. (289,706.)

27,105. "Electrical insulators." J. E. Pollak (Hermsdorf Schomburg-Isolatoren Ges.). October 12th, 1927. (289,709.)

27,776. "Electric measuring instruments." British Thomson-Houston Co., Ltd. October 19th, 1926. (279,456.)

27,835. "Electrical massage apparatus." L. F. Payet. October 20th, 1927. (289,712.)

27,898. "Electrical distribution systems." British Thomson-Houston Co., Ltd October 22nd, 1926. (279,472.)

28,602. "Dynamo-electric generators." International General Electric Co., Inc. October 29th, 1926. (279,873.)

29,575. "Means for braking trains by use of track apparatus." Siemens and Halske Akt. Ges. November 6th, 1926. (280,230.)

29,584. "Telephonic ear-pieces." General Acoustics, Ltd (Dictograph Products Corporation) November 4th, 1927. (289,719.)

31,565. "Methods of and apparatus for making electric incandescent lamps and similar articles." British Thomson-Houston Co., Ltd. December 4th, 1926. (281,639.)

31,491. "Ventilation of turbo-driven alternators." Forges & Ateliers de Constructions Electriques de Jeumont. January 5th, 1927. (283,145.)

32,123. "Short-circuiting devices for series electric systems." Metropolitan-Vickers Electrical Co., Ltd. November 30th, 1926. (281,661.)

34,395. "Production of aluminium by fusion electrolysis." I. G. Farbenindustri Akt. Ges. January 21st, 1927. (283,949)

34,506. "Safety devices for Röntgen-ray apparatus." W. Otto. January 3rd, 1927. (283,106.)

1928.

95. "Thermioric valve circuit arrangements." Marconi's Wireless Telegraph Co., Ltd. January 11th, 1927 (283,497.)

482. "Electric welding." British Thomson-Houston Co., Ltd. January 10th, 1927. (283,483.)

1,720 "Long-distance telephone cables." Siemens & Halske Akt. Ges. February 3rd, 1927. (284,664.)

3,367. "Synchronous motor for driving electrical time-measuring devices and the like." Allgemeine Elektricitats Ges. February 2nd, 1927. (284,658.)

3,469. "Apparatus for picture and the like telegraphy." Telefunken Ges. für Drahtlose Telegraphie. February 3rd, 1927. (284,677.)

8,201. "Rotary compressors." International General Electric Co., Inc. March 19th, 1927. (287,457.)

Trade Mark Applications.

THE following are among the recent applications for British trade marks. Objections against any of the proposed marks may be entered within one month from May 16th, 1928:—

Henlita No. 488,599. Class 8. Electric cables.—W. T. Henley's Telegraph Works Co., Ltd.

Dralowid. No. 490,412. All goods in Class 8.—Mullard Radio Valve Co., Ltd.

Holviglass. No. 489,182. Class 11 Ultra-violet ray instruments.—Holophane, Ltd.

Magnet (lettering and design). No. 489,864. Class 18 Ovens, cooking ranges, &c.—General Electric Co., Ltd.

Penetrol. No. 490,127. Class 50. Insulating substances (electrical) of asbestos, mica, resin, oils or bitumen.—Silvertown Lubricants, Ltd.

New Work for Contractors.

Particulars of new works and building schemes for the use of electrical installation contractors in search of work and all interested in the sale of electrical and allied plant and other products.

Publication in this list is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

ABERDEEN.—Extension of Fishmarket (£130,000); the superintendent.

ALDBOROUGH.—Elementary school and centre, West Riding Education Committee.

ALTRINCHAM.—Extension of the County High School for Girls; F. A. Browne, county architect, Newgate Street, Chester.

AXBRIDGE.—Housing scheme (30), for the R.D.C.; Ball and Pope, architects, 30, West Street, Weston-super-Mare.

BARNES (SURREY).—Roman Catholic church, Castlenau; H. W. Binns, architect, Soho Square, W. Houses (26), Tangier Road, for G. E. Sturgis & Son.

BECKENHAM.—Extensions, County School for Girls; Kent Education Committee.

BEDFORD.—Alterations, Simplex Works, Elstow Road; Motor Rail & Tramcar Co., Ltd.

BENTLEY.—Police station (£7,000), West Riding Standing Joint Committee.

BEXHILL.—50 houses, Sidley Estate; Norman Smith & Son, Maidstone. Bank, Devonshire Road; J. E. Maynard, for Barclay's Bank, Ltd.

BINGLEY.—Proposed extensions, Grammar School; clerk, Urban District Council.

BLYTH.—50 houses, Princess Louise Road, by direct labour; borough engineer. Promenade and sea wall (£10,000); borough engineer.

BOURNEMOUTH.—Alterations, The Westover, Westover Road; Savoy Cinemas, Ltd. 18 shops and flats, Holdenhurst Road and Victoria Place; Hayward & Abbott.

BRIDGEWATER.—Houses (100), Victoria Road site, for the T.C.; W. B. Colthurst, architect.

BRIGHTON.—Accommodation for defectives; Corporation and Board of Guardians.

CANTERBURY.—Conversion of premises into municipal offices, with electrical work and heating, for the T.C.; P. H. Warwick, city engineer.

CASTLEFORD.—Wesleyan church, Airdale (£4,000); trustees.

CHALFONT ST. PETER.—Central school for Bucks E.C.; C. H. Riley, county architect, Aylesbury.

CHATHAM.—Additional 80 houses, for the T.C.; borough surveyor. Extensions, County School for Girls; Kent Education Committee.

CHELMSFORD.—P.O. engineering stores, Friars Place; Holland & Day.

CLACTON-ON-SEA.—Dance hall, café, &c. (£10,500), for the Clacton Amusements, Ltd.; W. H. Wrightson, architect.

COALVILLE.—Catholic church; McCarthy, Collings & Co., architects, Central Chambers.

CONISBOROUGH (YORKS.).—Housing scheme (28), for the U.D.C.; surveyor.

COVENTRY.—New St. Alban's Church, Stoke Heath; H. Bulkeley Cresswell, architect. Housing scheme (30), for the T.C.; A. F. Underhill, housing director (returnable deposit of £3 3s.).

CROMPTON.—Housing scheme (100), Hey Head Estate, for W. Johnson & Sons.

DERBY.—Housing scheme (108), Alvaston, for the T.C.; borough surveyor.

DONCASTER.—Warehouse, Great North Road, and business premises, Thorne Moorends, for the Co-operative Society; secretary.

DUCKMANTON.—Hotel (£8,000), for the Chesterfield Brewery Co., Ltd.

DUNDEE.—Alterations and renovation at Bell Street Church (installation of new heating system and lighting improvements); the minister. Conversion of church into furniture dealing establishment; John L. Robertson, Ltd., cabinet maker, 14, Constitution Road.

DUNVEGAN (ISLE OF SKYE).—Bank and agent's house, for the National Bank of Scotland; D. Matheson, architect, Dingwall.

EASTBOURNE.—Development, Victoria Drive Estate; Mark Hookham, Ltd. Three blocks of flats, Southfields Road, for United Women's Homes Association; Hendry & Co., architects.

EDINBURGH.—Cinema for Scottish Cinema and Variety Theatres; the secretary.

ELLESMERE PORT.—Three blocks of semi-detached houses for the U.D.C.; T. W. Francis, clerk (returnable deposit of £5 5s.). Cinema, Westminster Road, for Robert W. Beatty. Church, for the Roman Catholic Church; priest-in-charge.

GILLINGHAM (KENT).—Two schools (£56,000), for the Borough E.C.; clerk. General offices, for the Maidstone and District Motor Services, Ltd.; Ruck & Smith, architects, Maidstone. Institute, &c., Third Avenue, for the United Methodist trustees.

GREENOCK.—Extension of mills, new wool warehouse, &c. (£25,000), for Fleming, Reid & Co.; the manager.

HAMPTON.—Alterations, &c., public offices, for the U.D.C.; S. H. Chambers, surveyor (returnable deposit of £2 2s.).

HASTINGS.—Private wards, Buchanan Hospital, Springfield Road; H. Ward & Son, architects.

HEADINGTON (OXON.).—Housing scheme (60), Barton Estate, for the U.D.C.; surveyor.

HECKMONDWIKE.—Extensions, Secondary School (£13,300); West Riding Education Committee.

HERNE BAY.—Development, Burton Downs Estate; Herne Bay Estates, Ltd.

HIGH WYCOMBE.—Extensions, Royal Grammar School, for Bucks. E.C.; C. H. Riley, county architect, Aylesbury.

HILLMORTON (RUGBY).—Church and Sunday schools, for the Wesleyan trustees; C. J. Newman architect.

ITCHEN ABBAS.—School for Hants. E.C.; A. L. Roberts, county architect, The Castle, Winchester (returnable deposit of £1 1s.).

LEEDS.—Roman Catholic church and school; rector of St. Patrick's.

LEICESTER.—Wesleyan church (£7,000); trustees.

LEWES.—Secondary school for boys (£20,611), for East Sussex E.C.; J. H. Baines, director of education.

LONDON (E.C.).—Renovations, Guildhall School of Music (£4,000); city engineer. Buildings, surplus land in Little Britain; Charles Holliday, Ltd.

(EAST HAM, E.).—Dental clinic, tuberculosis dispensary, and electrical showroom, for the T.C.; borough engineer.

(ST. MARYLEBONE, N.W.).—Buildings, Salisbury Street; E. W. Banfield.

(ST. JOHN'S WOOD, N.W.).—Buildings, St. John's Wood Road; E. Howard & Partners.

(LAMBETH, S.E.).—Extensions, Beaufoy Institute (£9,500); C. P. Roberts & Co., Ltd., Dalston.

(KENSINGTON, S.W.).—Furniture depository, Golden Mews, for Hildreth, Ltd.; G. Guy Rogers, architect, Upper Hamilton Terrace.

(WESTMINSTER, S.W.).—Extensions, School of Cookery and Waiting; L.C.C. Education Committee.

LUTON (BEDS.).—Houses (39), Wardown Crescent, for C. Jeyes. Houses (38), Kingsway, for A. Carter. Houses (15), Richmond Hill, for the Leighton Buzzard Brick Co., Ltd.

MALTBY.—Secondary school; West Riding Education Committee.

NEWPORT (ISLE OF WIGHT).—Bank, for the Westminster Bank, Ltd.; J. W. S. Burmester & G. Whittaker, architects, London.

OSWESTRY.—Houses (38), for the T.C.; Francis Roberts and Sons, builders, Trevor, Wrexham.

OXFORD.—Warehouse, Broad Street; Messrs. Alden.

PAIGNTON.—Estate development, Colley End Road; Willkins Bros. Estate development, Laura Grove; Paignton Land and Development Co., Ltd. Extensions, Elmbank Road; Paignton Co-operative Society, Ltd. Additions, Palace Hotel, Streatfield Road; Palace Hotel (Paignton).

PENRITH.—'Bus garage, for Armstrong & Siddle's Motor Services, Ltd.; H. Oldfield, architect, Workington.

PERTH.—Secondary school (electric lighting, &c.).—R. Martin Bates, executive officer, Education Authority. Corporation housing scheme (£72,000); T. McLaren, burgh surveyor.

PORTSMOUTH.—Factory, 382-4, Commercial Road; Papps and Son. Extensions, warehouse, 79-81, King Street; Reynolds & Co. Factory, Goldsmith Avenue; Danish Bacon Co., Ltd.

RAMSGATE.—Re-erection of stores for the Isle of Thanet Co-operative Society (several thousand pounds).

RICHMOND (SURREY).—Church, corner of Atwood and Markesbury Avenues; E. A. Swann, architect.

ROMFORD.—Bank, Hare Street, for Lloyd's Bank, Ltd. Houses (86), Marshall Drive, builders, Forest Road, Loughton. Houses (30), Growth Avenue, for T. A. Clark.

ROSSINGTON.—Police station (£8,100); West Riding Standing Joint Committee.

ST. HELENS (LANCS.).—Greyhound racing track, for the St. Helen's Race Course Co., Ltd. Cinema, Duke Street and North Road, for H. Platt.

SOUTHPORT.—Beauford memorial hall, Havelock Sutton, architect; Meadow Bros., builders.